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Simple in Construction—Unfailing in Performance

ATWATER KENT SCIENTIFIC IGNITION

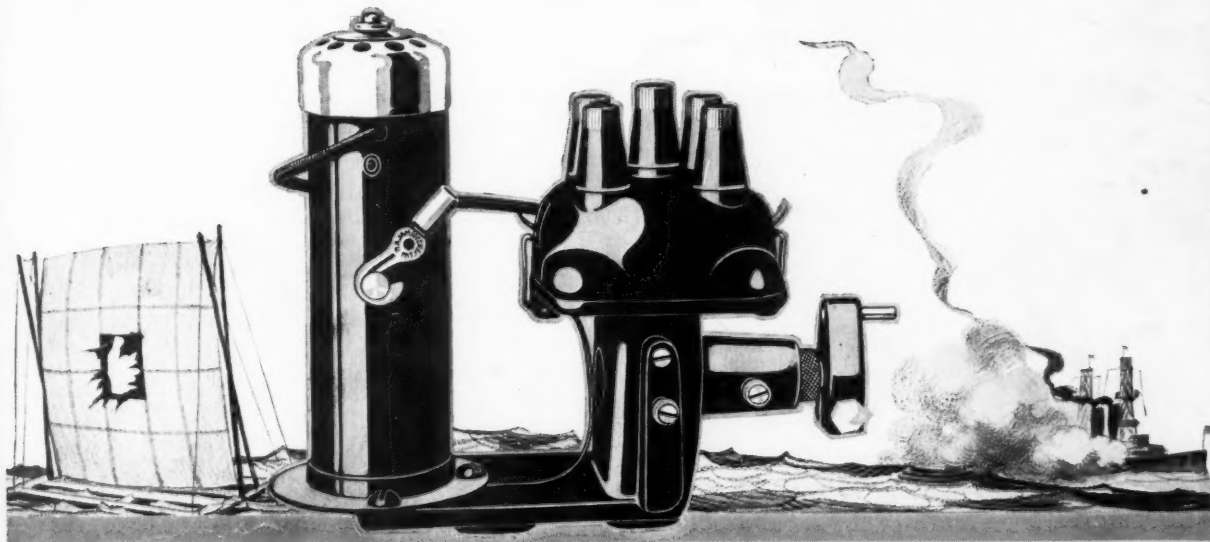


Illustration shows Type CC Magneto Replacement System

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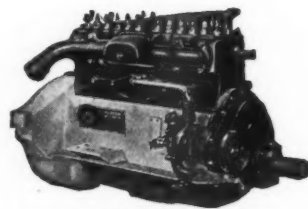
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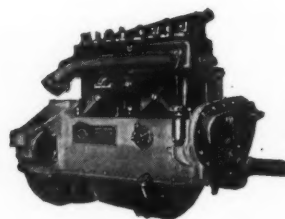
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AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

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NEW YORK—THURSDAY, MARCH 6, 1919—CHICAGO

NO. 10

Lyons Fair Discloses New Post-War Models

About One-Third of French Makers Have Entirely New
Products—Remainder Have Pre-War Products—
Electric Starting and Lighting Universal

TENDENCY TOWARD STANDARDIZATION PLAINLY APPARENT

Block Cylinders, Detachable Heads and Other Modern American
Characteristics Come to the Front

By W. F. Bradley

AUTOMOTIVE INDUSTRIES' European Correspondent

LYONS, FRANCE, March 2—*Special Cable*—Europe's first great exhibition of post-war models—the Lyons Fair—was thrown open to-day and holds a record number of exhibits with those of automobile manufacturers grouped prominently together in one big hall. All told there are 90 separate automobile exhibits and though it was hardly to be expected that the fair would disclose a great deal that is new in the way of post-war models, it has, nevertheless done so.

Trend Toward Standardization

Perhaps the most striking feature of the automotive exhibits as a whole is the marked trend toward greater standardization and the use of engineering practices which long have been features of American products. This applies particularly to the universal use of electric lighting and starting equipment, the use of block cylinders with detachable heads and the fitting of practically all low

and moderate price cars not only with bodies but with all other equipment as well.

As the Lyons Fair not only takes the place of that of Leipsic, but aims to surpass it in every sense, it is of interest to note that the number of exhibitors passes all previous records, the actual number being 4,700. Naturally, the French exhibitors predominate with a total of 2,994, but the United States makes a very creditable showing with a total of 618.

Few Foreign Cars Exhibited

Apart from the general interest surrounding the first after-war efforts of manufacturers to display their products on a really large scale, the fair holds much of interest for the American manufacturer of automotive products. It is true that automotive exhibits are relatively few, but the interest is still there. In all, there are six exhibits of cars of European make other than those of French manufacture. This small total is doubtless due to the fact

Pronounced Engineering Tendencies at Lyons Fair

- | | |
|--|---|
| 1—Increasing use of cantilever springs. | 6—Detachable wheels with clincher rims. |
| 2—Two-unit lighting-starting systems. | 7—Transverse pump and magneto shafts. |
| 3—Adoption of detachable cylinder heads. | 8—High class cars, six-cylinder. |
| 4—Unit construction of engine and gearbox. | 9—Only one eight, no twelves. |
| 5—Spiral bevel final drive. | 10—Low-priced cars all fours. |

that at the present time the importation of automobiles to France is prohibited owing to causes relating to internal commercial economics. So far, there is but one American car, the Columbia, actually on exhibition, but it is anticipated that there may be others represented before the fair is in full swing.

About one-third of the French exhibitors are showing entirely new models, the remainder exhibiting pre-war cars with the addition of electric lighting and starting equipment. It is significant that no car shown is minus a complete electrical system, in view of the fact that hitherto starting and lighting, as looked upon in America as forming part of the regular equipment of a passenger car, has been either absent or in some few cases has been installed as an extra at additional cost.

Cantilever Springs Featured

Dominating tendencies, as applied to general production, have been conspicuous by their absence in European engineering practice in the past. Each factory has, rather, relied on its engineer's expression of individuality in its product. It is a sign of a new order of things that there is now a decided tendency to the use of cantilever springs, detachable cylinder heads, two-unit starting and lighting systems and spiral bevel final drive. Power plants, where the engine, clutch and gearset combine to form a unit, are another feature which is much in evidence and which evinces a trend toward American practice.

Detachable Steel Wheels

Magneto ignition is practically universal, a condition which is far different from that obtaining in the United States. Detachable wheels with permanent rims of clincher type are popular; in fact, the clincher type of tire attachment fully maintains its popularity. There is considerable use of detachable steel wheels, usually of Michelin make.

Individually designed bodies have always been a

point with the European manufacturer and the fair discloses that sombre colors predominate. Detachable upholstery is featured and a departure from pre-war practice is indicated by the fact that all the lower-priced cars now are offered complete with all accessories.

No Twelves; Only One Eight

In the higher-priced grades engines having six cylinders predominate practically to the exclusion of all others; there are no twelves and the only eight-cylinder is the De Dion Bouton, a model which has been on the market for some years. The announcement has been made that the Lorraine-Dietrich company will build a twelve and also two six-cylinder models.

The Delage, known in the United States through its success as a racing machine, has a striking exhibit of a six-cylinder model with block-cast engine and bore and stroke of 80 x 150 mm. This engine is designed to develop 70 hp. and is fitted with a starting motor operating through a Bendix drive. Brakes are fitted on all four wheels, operating on 15-in. drums and designed to stop the car in 100 yd. or less at 60 m.p.h. High-class work and refinement of detail are in evidence throughout this car, which sells in France for approximately \$5,700. This car is equipped with wire wheels.

Few New Manufacturers

But few new firms have entered the automotive industry, doubtless owing to the limitations placed on private enterprise by the universal need for the production of war munitions. An exception is that of the Voisin Aeroplane Co., which is building a car powered with a 40-hp. Knight engine. The Citroen Co. is building a light four-cylinder machine and the Swiss Picard-Pictet Co. is now backed by the manufacturers of the well-known Gnome rotary airplane engine.

Mayen, the biggest aviation engine builder in

France, is producing Hispano-Suiza cars under license and it may be said that the three most prominent European builders to-day are Peugeot, Fiat and Citroen. Much attention is being given to the production of light four-cylinder cars and it is in this connection that these three concerns are mentioned. The light-weight Fiat comes out at 1400 lb., the Peugeot at 1350 lb., and the Citroen is the same weight as the Fiat.

Left Steering, Center Control

Although the Fiat is considered to be a popular model, in a relative sense, it is of especially high-class construction. Cylinders are block-cast and have a bore and stroke of 65 x 110 mm., heads are detachable, the crankshaft has three bearings, the power plant is a unit and lighting and starting are included as regular equipment. Final drive is spiral bevel, the wheels have detachable steel spokes and the rear axle is of full-floating type.

A new Peugeot is, in effect, an enlargement of the well-known Baby Peugeot of former years. Bore and stroke are 60 x 100 mm. and the crankcase is a single casting, the only example in the fair. This car has left-hand steering—unique in European practice—and center control. Detachable wood wheels are fitted and the springs are of cantilever type.

Frame Construction Changing

The new Citroen has a block-cast engine of 65 x 100 mm. bore and stroke with detachable cylinder heads. Here, again, is left-side steering featured in conjunction with center control. The crankshaft has two bearings, final drive is through Citroen herringbone gears and the rear springs are single quarter-elliptics. Double quarter-elliptic front springs are fitted, one above and the other below the axle. The price of the two-seater is approximately \$1,450. In this class car the usual frame construction embodies three cross-members, power plants being carried on three-point suspension.

This three cross-member feature is also incorporated in higher grade cars, but in these the engine is carried on four points in order to stiffen the

frame. Front crankcase webs are carried out, avoiding the use of underpans and a material increase in the depth of the frame side-members is evident.

Five Makers Produce Tractors

Panhard and Levassor are producing both Knight and poppet valve models, but, except in the case of the Voisin company, there is no extended use of the Knight type of engine. There are no new valveless engines.

Automobile firms which are engaged in the production of farm tractors are Peugeot, Fiat, Paris Omnibus Co., Schneider and Latil, but it is reported that the Renault and Panhard companies are also building tractors, although they do not exhibit them. The Fiat tractor is built generally along the lines of the Fordson, but is larger and heavier, using a 4-ton truck engine.

The Peugeot tractor is of track-laying type with a modified truck engine and the Paris Omnibus Co.'s machine is built under the British Saunderson license. Trailers for commercial service occupy an important position at the fair for the first time, their importance as shown in war-service having led the firms producing them to develop them for use under normal conditions. They are exhibited in two and four-wheel types and invariably have rubber tires.

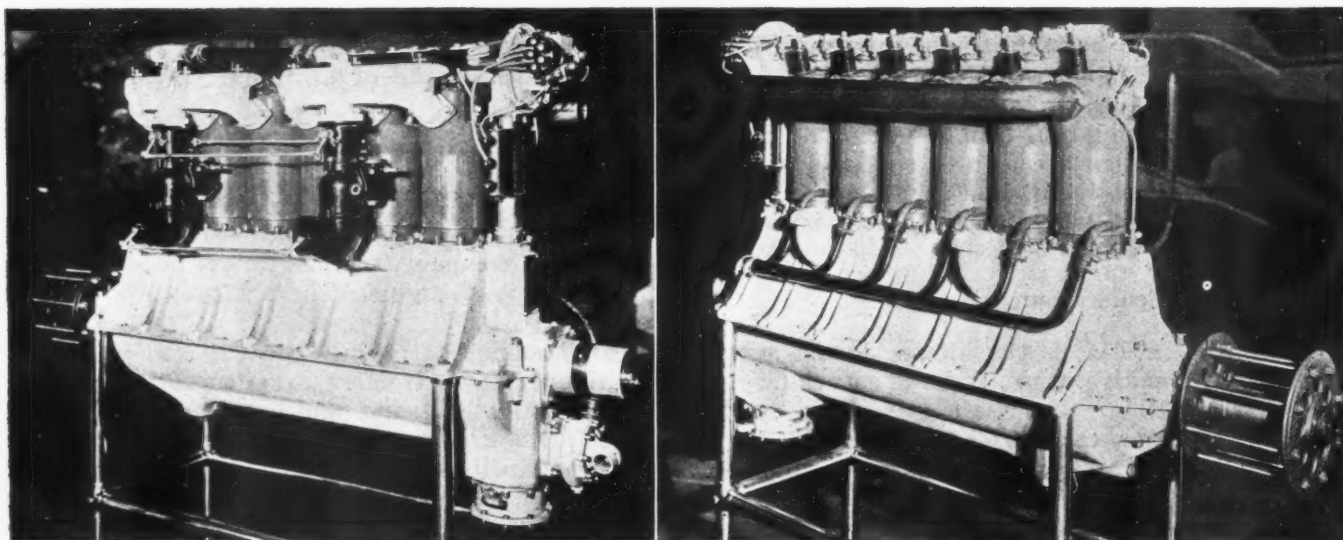
Lowest Priced Car Costs \$950

The lowest priced car at the fair is exhibited by the Lyons Aviation Co. It is a four-seater with electric lighting and starting, two-cylinder, two-cycle engine with a bore and stroke of 75 x 120 mm. and a wheelbase of 123 in. The body is of enameled sheet steel, the four seats are adjustable and the weight is 1300 lb. Present price is approximately \$950, but it is stated that if 10,000 cars are sold by the end of March the price will be reduced by about \$40.

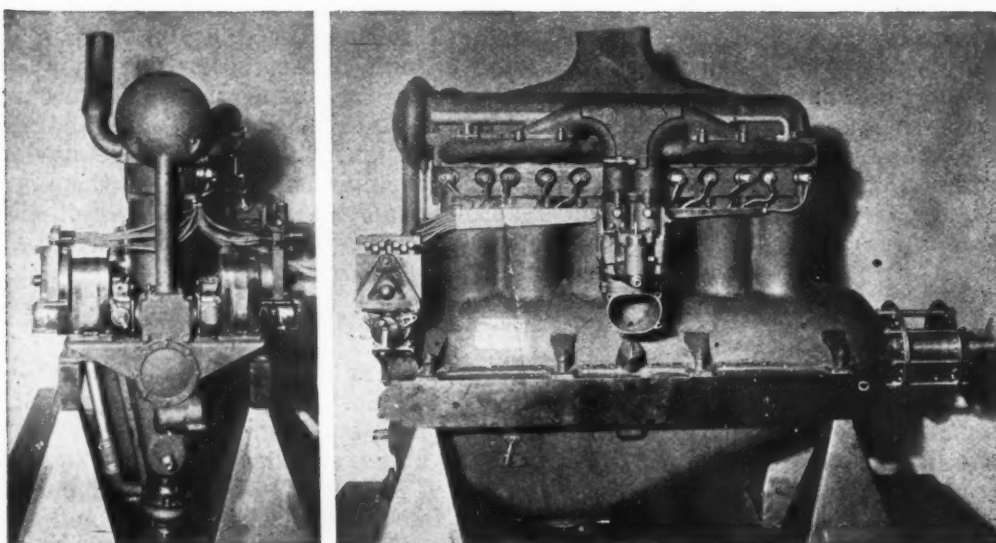
Announcement was made to-day that an automobile show would be held in Paris next fall, but the actual date is not yet determined, nor has it been decided where it will be held.

Trends in European Body Design

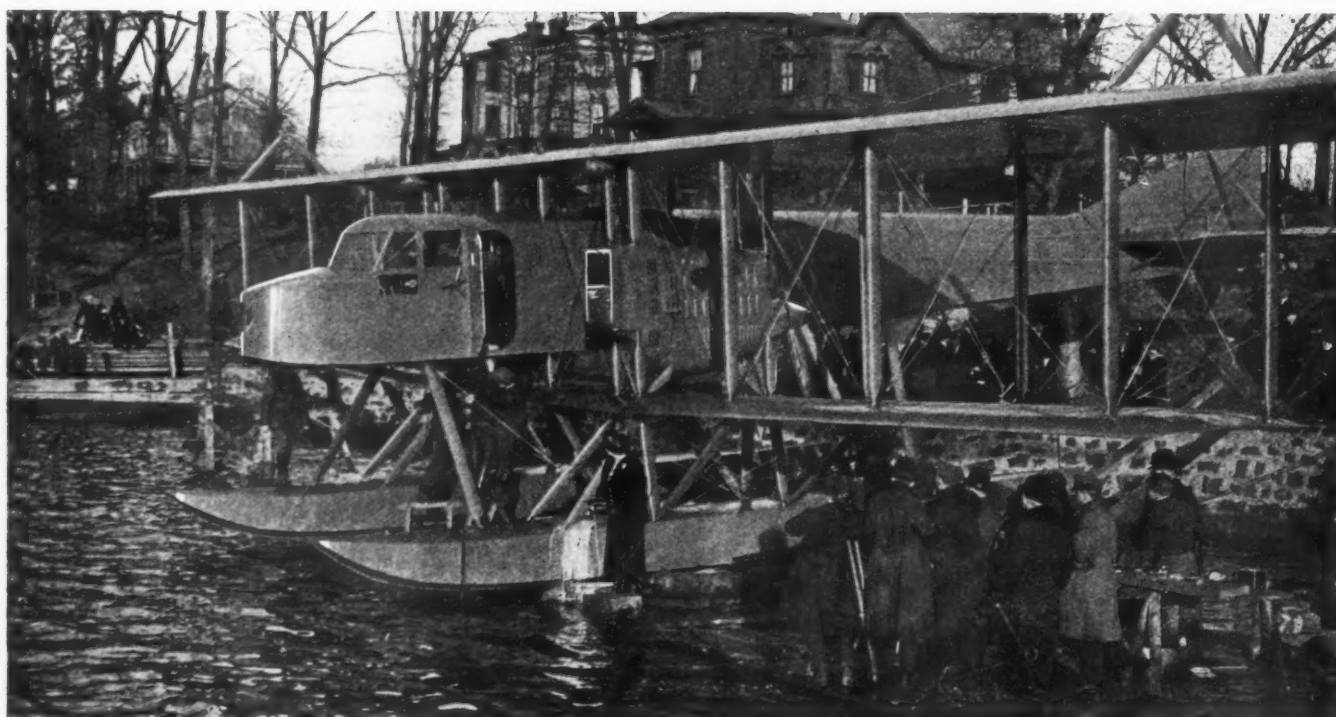
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| 1—Increasing use of detachable upholstery. | 4—Left steering, center control increases. |
| 2—Sombre color schemes the rule. | 5—Many detachable steel wheels. |
| 3—Cheaper cars completely equipped. | 6—New fours light in weight. |



*Intake and exhaust
sides of the six-cylinder
Liberty aircraft engine*



*The new six-cylinder
Curtiss engine showing
arrangement of the
two magnetos*



The large seaplane which has been developed for an attempt at the trans-Atlantic flight

Element of Practical Business at Aeronautical Exposition

Few Commercial Adaptations But Plenty of Promise— Extensive Army and Navy Exhibits

NEW YORK, March 1—The first aeronautical exhibition since the war ended, which opened here tonight in Madison Square Garden and the 69th Regiment Armory, under the auspices of the Manufacturers' Aircraft Assn., is notable from at least three points of view:

1—It demonstrated by the huge crowds it attracted the tremendous public interest in the latest means of rapid transport;

2—It provided fruitful opportunities for students of modern aerial warfare, amateur and professional, to become acquainted with the very latest develop-

ments of both military and commercial machines;

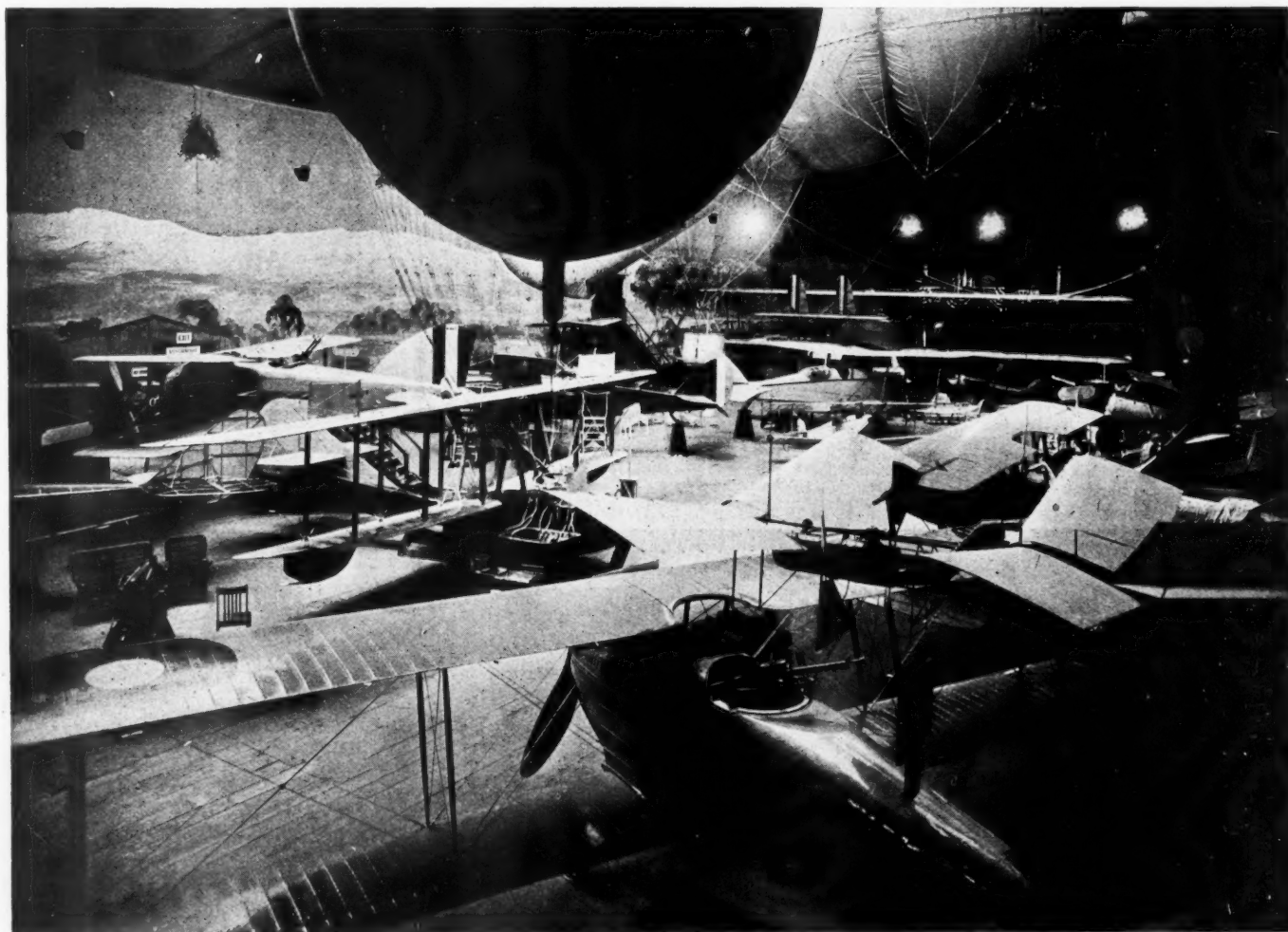
3—And, perhaps most important of all, it sounded an unmistakable keynote of energy and optimism on the part of the aeronautical industry.

The present show differs from all previous shows, both in this country and in Europe of pre-war days, in the introduction of the element of practical business.

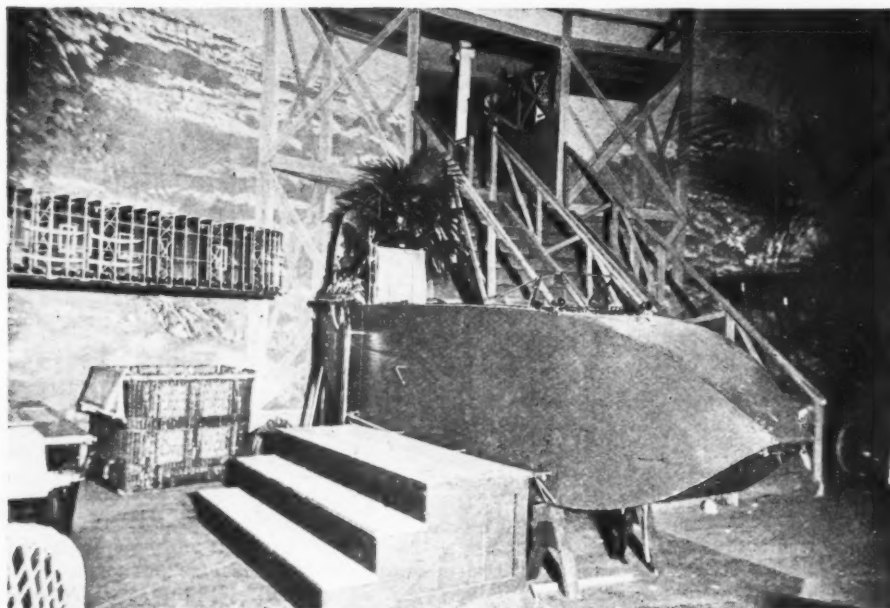
Although the exhibits are dominated by aircraft built solely for war purposes, there is easily recognizable in the spirit of the show the determination of the industry to switch over a large share of its energy to civil aeronautics.

It is true that there are no special dump bodies or attachments for the carrying of merchandise on exhibition but not much imagination is required to transform the bomb-carrying devices of the larger planes and air-boats into equipment for peaceful purposes.

The big Caproni triplane, which spans one end of the Armory, has a large structure under the lowest wing that carries 3300 lb. of bombs. And many of the smaller planes, seating one or two passengers, carry three or four guns, an appreciable weight that would be made available for freight in the commercial airplane.



General view of the aeronautical exhibits in Madison Square Garden. Suspended at the right is the steam-driven plane designed and flown by the pioneer Langley twenty-three years ago



A corner of the Goodyear company's exhibit, showing a dirigible car equipped with a Curtiss 100-hp. engine designed for 28 hr. continuous flight with four men aboard. To the left is a scale model in skeleton of the car for a proposed 1,000,000-cu. ft. dirigible to carry twenty-four passengers

But in spite of the probable early demand for commercial load-carrying aircraft, the feeling seems to be general among the manufacturers who have specialized on the smaller military machines that the readiest means of establishing themselves on a sound basis lies in the appeal to the sportsmen of the country first and afterward to the larger business of passenger and freight carriers.

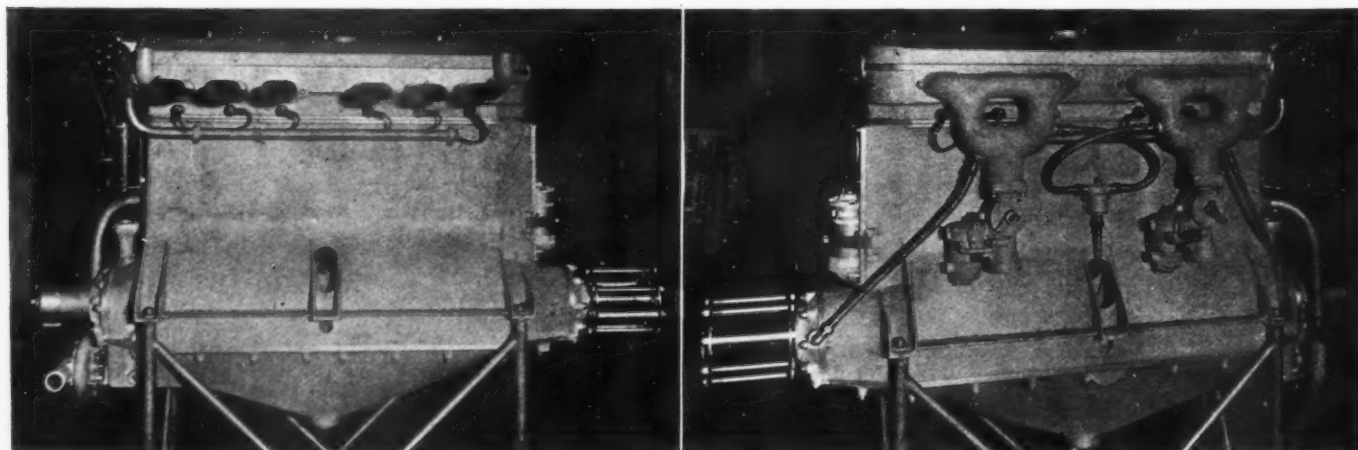
Having developed machines that are satisfactory for military or training purposes, they intend to continue turning them out with as little change as possible for a class of user who is likely to make the quickest response. There can be no doubt that the sportsman aviator already exists in appreciable numbers, and the manufacturers have started out to meet him in the New York show by displaying a number of single and two-seated planes and flying boats with a strong sporting appeal.

Enter the Sport Plane

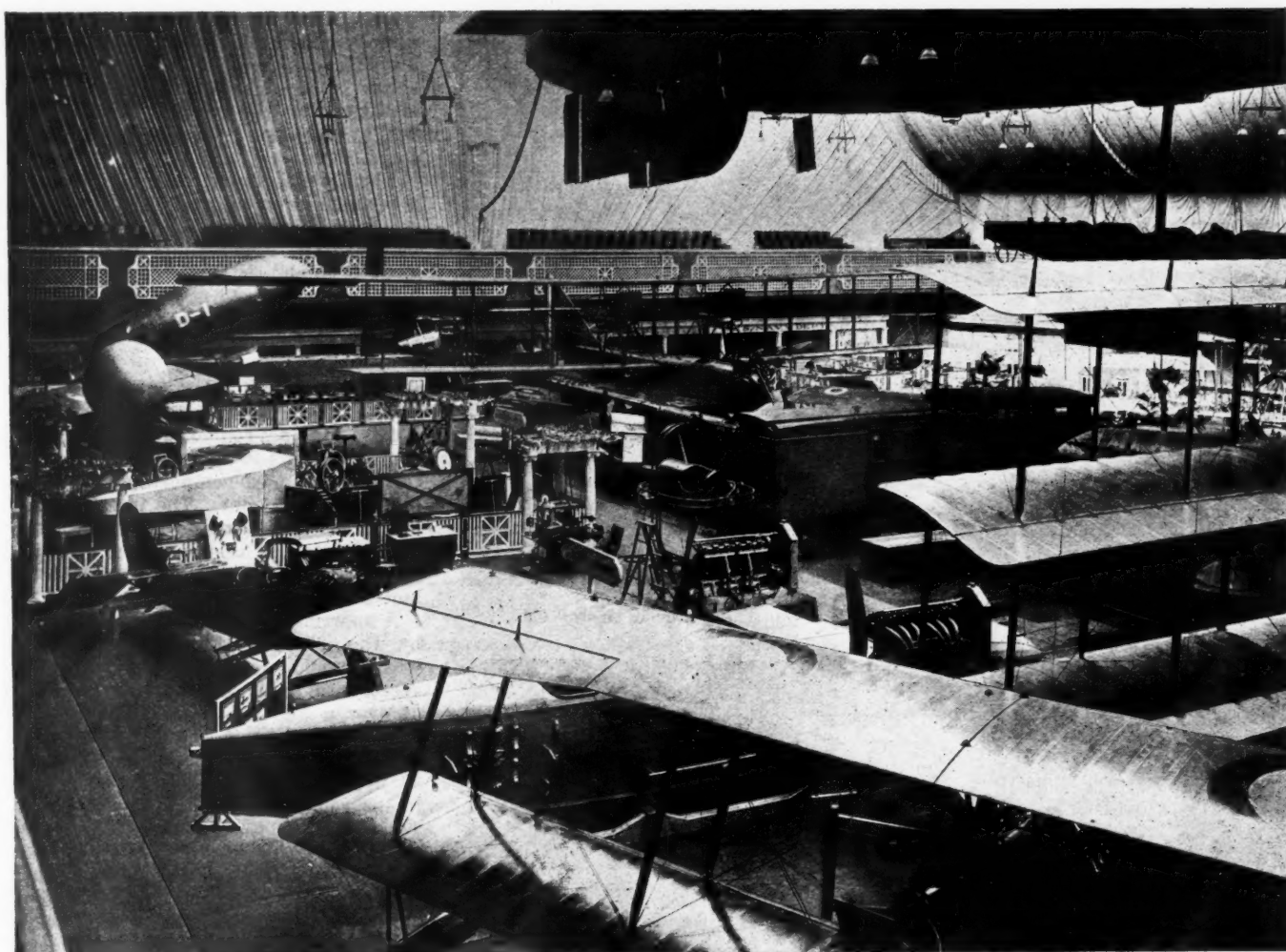
Typical of these machines is the Packard, which seats two in tandem; the Curtiss MF two-seated flying boat, in which the passengers sit side by side; the L. W. F. hydro airplane; the Messen-

American-Built Airplanes at New York Aeronautic Show

Name and Model	Type	Make of Engine	Cylinders and Dimension	Seats	Wing Span (ft. in.)	Chord (in.)	Gap (in.)	Length (ft. in.)	Weight (Loaded) (lb.)	Speed (m.p.h.)	Duration (hr.)	Ceiling (ft.)
Aeromarine	Seaplane	Aeromarine	6-3 1/4 x 6	2	48.4	75	78	25.6	1,925	80	2 1/2	8,000
Boeing	Seaplane	Hall-Scott	4	2	43.6	69	72	27.0	2,430	75	3	...
Christmas	Biplane	Hall-Scott	6-5 x 7	1	28.0	60	60	21.0	2,100	175	1 1/2	...
Curtiss 18-B	Biplane	Curtiss	12-4 1/2 x 6	2	40.0	48	69	24.0	2,900	163	1 3/4	2,500
Curtiss	Seaplane	Curtiss	8	2	49.9	60	...	28.10	2,432	69	...	...
Curtiss H. A.	Biplane	Liberty	12-5 x 7	2	36.0	72	70 5/32	30.9	2,650	132	2 1/2	20,000
Curtiss J. N. 4	Biplane	Curtiss	8	...	43.7	59 1/2	...	27.4	2,130	75	...	...
Dayton-Wright	D-H-4	Liberty	12-5 x 7	2	48.0	66 1/4	66	28.0	4,150	126	4	22,500
Dayton-Wright	Honeymoon	Liberty	12-5 x 7	2	48.0	66 1/4	66	28.0	4,150	126	4	22,500
Dayton-Wright	Messenger	De Palma	4	1	19.3	39 9/16	44 1/2	17.6	475	85	2	5,000
Gallaudet	Monoplane	Indian (2)	2-3 3/4 x 5	2	33.0	54	...	18.6	600	84	...	...
Gallaudet	Seaplane	Liberty	12-5 x 7	2	46.0	84	90	33.0	5,400	132	3	14,100
Glen-Martin	Biplane	Liberty (2)	12-5 x 7	2	71.6	114	132	42.0	5,700	118	3	18,000
Loening	Monoplane	Hisp. Suiza	8-140 x 150 mm.	2	32.0	84	...	21.0	2,600	145	3	25,000
Loening Kitten	Seaplane	Lawrence	3-4 1/4 x 5 1/4	1	18.0	48	...	13.0	500	...	...	...
L. W. F. G 3	Biplane	Liberty	12-5 x 7	2	39.0	80	76	28.8	4,550	134	4	...
L. W. F. HS-2L	Seaplane	Liberty	12-5 x 7	3	74.0	75	91	38.6	...	80	4	12,000
L. W. F. V.H-1	Seaplane	Sturdevant	8-4 x 5 1/2	2	46.6	80	82	31.1	3,437	95	6 1/2	15,000
Packard	Biplane	Packard	8-4 3/4 x 5 1/4	2	37.0	66	66	25.0	2,167	100.5	3 1/2	19,500
Thomas-Morse MB3	Biplane	Hisp. Suiza	8-120 x 130 mm.	1	26.6	...	...	...	2,000	163	...	...
Thomas-Morse S-7	Biplane	Le Rhone	9-105 x 140 mm.	2	32.5	...	...	21.6	1,480	90	...	...
Thomas-Morse S-6	Biplane	Le Rhone	9-105 x 140 mm.	2	29.0	...	...	20.8	1,385	105	...	...
Thomas-Morse S-4-C	Biplane	Le Rhone	9-105 x 140 mm.	1	22.6	...	...	19.4	1,150	112	...	...
United Aircraft	Biplane	Curtiss	8-4 x 5	2	43.7	...	...	...	...	80	...	...
Vought	Biplane	Hisp. Suiza	8-120 x 130 mm.	2	34.3	55 1/2	51	24.2	1,995	105.5	3	...



The new Aeromarine six-cylinder 125-hp. aero engine



General view of the 69th Regiment Armory section of the New York show, showing overhead the Navy Coast Patrol dirigible which has seen 17 months' service for the Government. In the background is the big F-5-L Navy flying boat

ger of the Dayton-Wright Co., a tiny one-seater biplane with a span of only 19 ft., and the flying boat of the Aeromarine Co., which seats two passengers under a celluloid top in addition to the pilot.

The features that will differentiate civil from military craft have not had time to develop since the signing of the armistice, but there is ample evidence that the industry is hard at work on these problems.

Several planes at this show boast of refinements that indicate this tendency. Windowed cowls that protect the occupants from the elements, superior body finish, ease of mounting, luxurious comfort of upholstery, beauty of body lines and color strongly resembling and obviously borrowed from the best motor car body practice are a few of these that strike the eye of the visitor. That more of these features were not in evidence is due solely to the fact that there had not been time to develop them. Most of the makers of military craft are anxious to continue production of proven models with only those changes that are necessary to turn them into everyday airplanes for civil use, mail and parcel carrying and sporting types.

That there is a prospective market for the really small machine, a sort of motor-cycle of the air, is suggested by the appearance of a tiny monoplane with floats, called the Loening Kitten, almost hidden under the shadow of the Navy F-5-L flying boat in the Armory, and one or two others scarcely any larger.

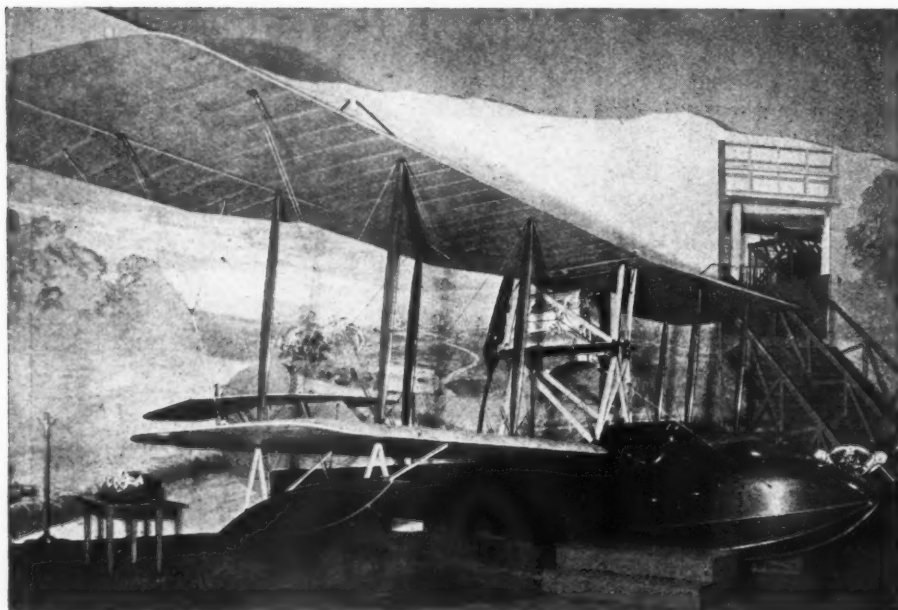
The Kitten has a wingspread of only 18 ft. and is equipped with an air-cooled Lawrence engine of 60 hp. It is a prac-

tical-looking machine with characteristics resembling the well-known Loening accepted by the Government for fast military work.

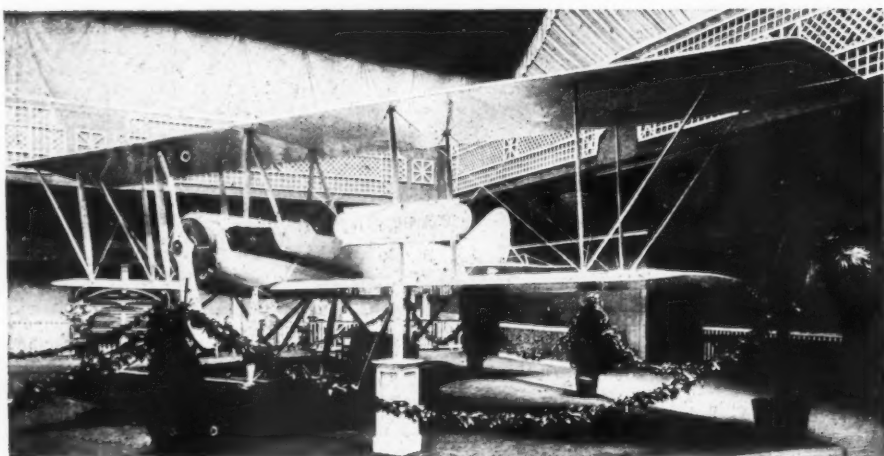
Another small plane with radical departures from standard construction is shown by the Gallaudet Aircraft Corp. The power plant consists of two Indian motorcycle engines connected through clutches and bevels to a pair of propellers on each side of the fuselage behind the

Complete Engines at the Aeronautical Show

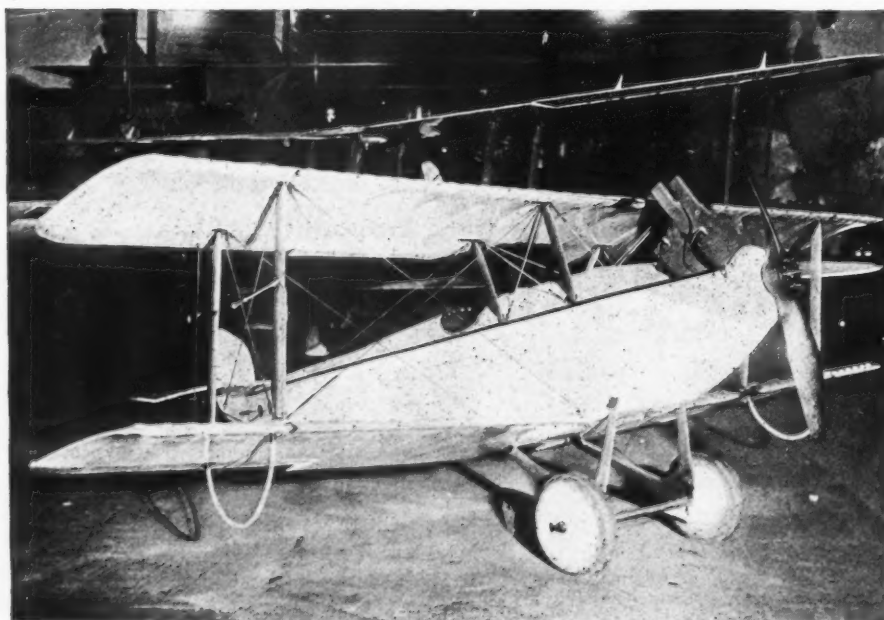
Name and Model	No. Cyl. Dimensions	Type	Cooling	Carburetor	Ignition	Weight, Lbs.
Aeromarine L.....	6-4.25 x6.5	Vert.	Water	Miller	Delco	410
Curtiss 6-4.5 x6		Vert.	Water	Ball & Ball	Berling	412
Curtiss K12.....	12-4.5 x6	V 45 Deg.	Water	Ball & Ball	Berling	680
Curtiss OX5.....	8-4 x5	V 90 Deg.	Water	Zenith	Berling	375
Duesenberg H.....	16-6 x7.5	V 45 Deg.	Water	Miller	Simms & Philbrin	1370
Duesenberg A.....	4-4.75 x7	Vert.	Water	Miller	Simms	450
Hall-Scott L6.....	6-5 x7	Vert.	Water	Miller	Delco	495
Hall-Scott A8.....	12-5.25 x7	V 60 Deg.	Water	Zenith	Dixie	1000
Hispano Suiza H.....	8-5.5 x5.9	V 90 Deg.	Water	Stromberg	Optional	575
Hispano Suiza E.....	8-4.72 x5.11	V 90 Deg.	Water	Stromberg	Optional	470
King-Bugatti.....	16-4.33 x6.229	Vert.	Water	Miller	Dixie	1160
Lawrence.....	3-4.25 x5.25	Y 120 Deg.	Air	Miller	Philbrin	132
LeRhône.....	8-4.135x5.51	Rotary	Air	Own	Dixie	260
Packard 1-A-744.....	8-4.75 x5.25	V 60 Deg.	Water	Own	Delco	710
Packard 1-A-1116.....	12-4.75 x5.25	V 60 Deg.	Water	Own	Delco	720
Sturtevant 5A-4½.....	8-4.5 x5½	V 60 Deg.	Water	Zenith	Dixie	480
Sturtevant 7.....	12-4.5 x6.5	V 60 Deg.	Water	Zenith	Dixie	900
Thomas-Morse 890.....	8-4.812x6	V 90 Deg.	Water	Stromberg	Dixie	590
Thomas-Morse L6.....	6-5 x7	Vert.	Water	Zenith	Delco	579
Tips.....	18-4.5 x6	Rotary	Water and Air	Own	Berling	855
W.B. B.	4	V 90 Deg.	Air	Own	Bosch	130



The three-passenger flying boat of the Aeromarine Plane & Motor Co.



The sporting model hydro-airplane brought out by the L. W. F. Co. is equipped with a 120-hp. Sturtevant



The Dayton-Wright company's single-seater "Messenger" has a span of only 19 ft.

wings. The Dayton-Wright Messenger, already mentioned, is also equipped with an air-cooled engine, of 37 hp. There seems to be a desire to try out the possibilities of air cooling to avoid the weight and complication of radiators and connections.

The Curtiss flying boat is fitted with a Spanish cedar hull that glows with the polish and finish of the high-priced automobile. The upper wing has a span of 49 ft. 9 in. and the lower 38 ft. 7 in. The landing speed is 45 m.p.h. and the maximum is 70 m.p.h. It is equipped with a Curtiss 100-hp. eight-cylinder engine with a bore and stroke of 4½ in. and 5¼ in.

The so-called Honeymoon Express shown by the Dayton-Wright Co. is suggestive of the refinements that are to come. It seats two passengers in a comfortable canopied compartment with the pilot's seat in front. The interior is upholstered and fitted with vanity and lunch boxes and even a mirror. Its cost ranges from \$15,000 to \$20,000. The motive power is a Liberty 12.

A sporting plane has been brought out by the Thomas Morse Aircraft Corp. with tandem seating for two, a landing speed of 38 m.p.h. and a flying maximum of over a hundred miles an hour. Another model, the S-7, has a side-by-side seating arrangement. Its maximum is 90 m.p.h. Both models use 80-hp. Le-Rhone radial engines.

Constructional Development

Of construction interest there is much to be seen. Several machines have streamline noses, with the radiator mounted in the wing. There is a noticeable tendency to more rugged construction throughout, in landing gear strut work and engine mounting. Already salesmen have discovered selling points and these are exhibited in the same way that automobiles are sold. On the Packard sliding doors on the side of the engine casing give access to the carburetor and the crankcase.

A model showing the progressive stages in the making of the monocoque fuselages for the L. W. F. planes is shown. This body has given entire satisfaction with regard to strength and streamline possibilities. It is made of successive layers of linen and wood set spirally over a former which collapses when the work is finished.

This company exhibits two marine models, one, the G-o, carrying seven machine guns and bomb-dropping devices. With these removed there would be ample provision for the carrying of mails or parcels. It is equipped with a Liberty engine and sells for about \$15,000. An L. W. F. sport hydroairplane is also shown. This model has a wing spread of 46 ft. and has two pontoons 18 ft. long. It seats two, is driven by a Sturtevant 120-hp. engine fitted with a starting motor and has a flying speed of 80 m.p.h.

Among the engineering exhibits is the Sturtevant company's solution of the problem of maintaining full power at high altitudes by feeding the carburetor automatically with air at a constant pressure. The device consists of an air pump driven by a belt from the crankshaft at

**SPECIAL EXHIBITS BY THE U. S.
ARMY AND NAVY**
At the New York Aeronautical Show

UNITED STATES ARMY

Planes

Handley Page.
Spad.
Fokker.
S-E 5.
Nieuport.
Caproni.
Albatross.
Hospital plane.

Balloons

French barrage.
Propaganda.
Balloons winch.
Balloons parachute.
Gas cylinders, knots, etc.
Voice control demonstration.
Photographic exhibit.
Motion pictures.
Photo hut.
Miniature artillery range.
Rocking Nacelle.

UNITED STATES NAVY

Planes

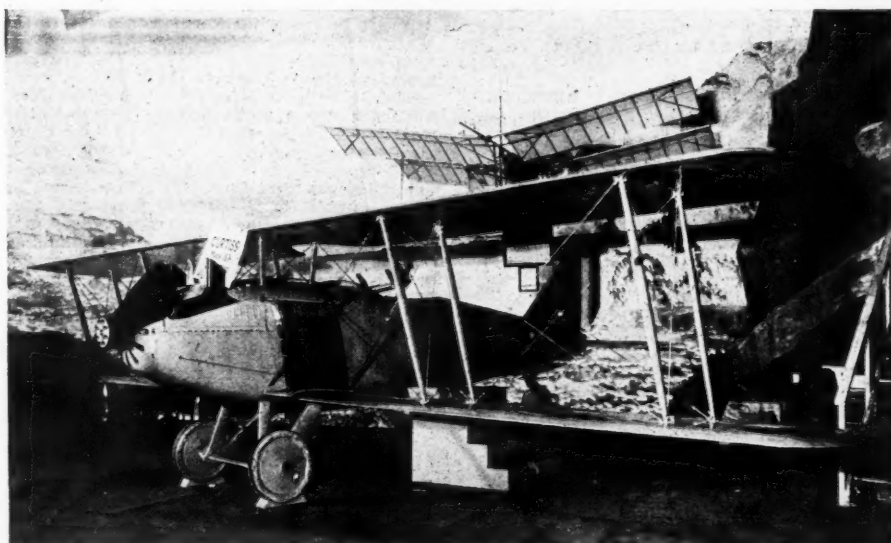
F-5-L boat.
Loering kitten.
Model of rigid dirigible.
Instruments.
Types of motors.
Types of propellers.
Self starters of different types.
Exhibits by Bureau of Steam Engineering.
Exhibits by Bureau of Ordnance, including various types of aerial bombs, machine guns, etc.
Exhibits by Bureau of Navigation, including altimeters, clocks, compasses, barometers, etc.
Exhibit of live pigeons, including birds with war service records.
Photographic exhibit, including motion pictures, equipment, samples, etc.

PLANE AND MOTOR EXHIBITORS

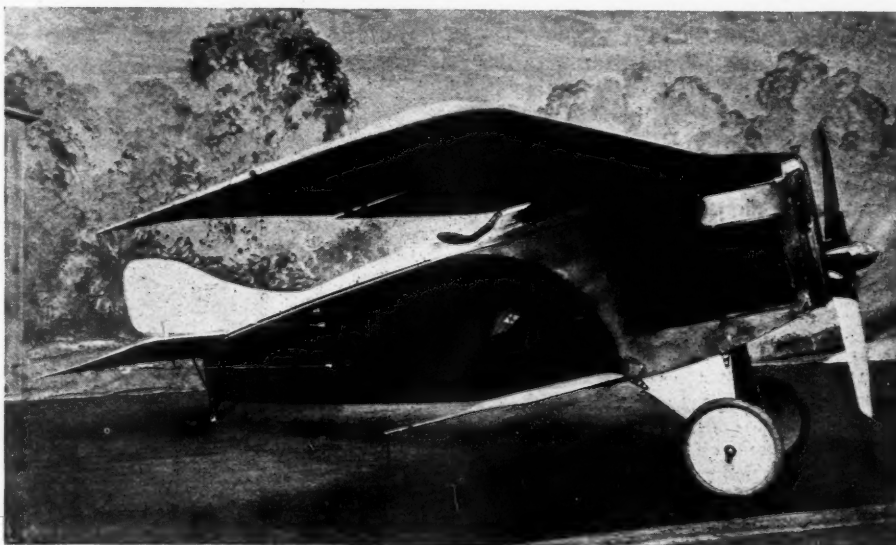
Army Air Service mechanical exhibit.
Aeromarine Plane & Motor Co.
Boeing Aeroplane Co.
Burgess Company.
Curtiss Airplane & Motor Corp.
Cantilever Aero Co.
Dayton-Wright Airplane Co.
Gallaudet Aircraft Corp.
Goodyear Tire & Rubber Co.
Gio Ansaldo & Co.
B. F. Goodrich Co.
L. W. F. Engineering Corp.
Glenn Martin Co.
Packard Motor Car Co.
B. F. Sturtevant Co.
Lawrence Sperry Aircraft Co.
Thomas-Morse Aircraft Corp.
United Aircraft Engineering Corp.
U. S. Army Hospital.
Wright-Martin Aircraft Corp.
Whittemore-Hamm Co.



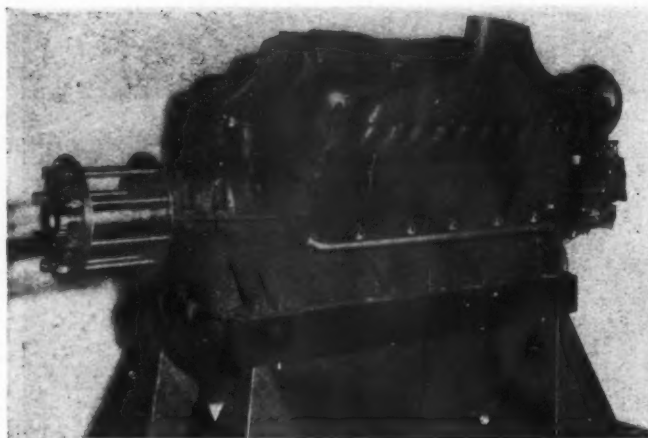
The Navy Coast Patrol dirigible built by the Goodrich company occupied most of the sky space in the Armory. This ship has covered 23,000 miles in Government service. It is 167 ft. long, has a volume of 80,000 cu. ft. and is driven by a 100-hp. engine



Curtiss model 18-B biplane, said to be capable of 170 m.p.h. The fuselage is similar to that used in the Curtiss K triplane



The Christmas "Bullet" has no exterior supports for the wings



The Curtiss 375-hp. twelve-cylinder aero engine has its cylinders set at a 45-deg. V. The bore and stroke are 4½ in. by 6 in. It weighs 680 lb.

a speed varied according to the altitude by an air controller. This controller is a small cylinder and spring supported piston open to the atmosphere. The position of the piston controls the tension of the belt. It is said to consume about 0.6 of the engine horsepower which represents a considerable increase on the available horsepower of an engine with the carbureter air inlet open to the atmosphere, at high altitudes.

The Navy exhibits, shown in an accompanying table, are of great interest. The big F-5-L flying boat is exhibited with one half of body and wing completely stripped, exposing the construction, the bomb release mechanisms, instruments, controls, gasoline tanks, guns, ammunition racks, etc. This machine is of the type which has done so much work in conveying transports and merchant ships. It carries a crew of five men and ammunition and bombs for 8 hr. at a speed of 80 m.p.h. The total weight, fully equipped, is almost 14,000 lb. Other Navy exhibits are the various instruments, clocks, compasses, barometers, etc., used in aviation work. A small model of a dirigible filled with helium, the new non-inflammable gas with a buoyancy only slightly less than hydrogen, is also shown.

Of Lighter-Than-Air Interest

The lighter-than-air side of the industry is well represented, and there is evidence of the same optimism and planning for the future. The Goodyear company is showing an army fuselage for dirigibles, equipped with a 100 hp. Curtiss engine, designed for 28 hours continuous flight with four men aboard. This company also shows a scale model for a passenger car for a proposed dirigible with a cruising radius of 5000 miles without landing. This ship will be 450 ft. long. The car is 50 ft. x 7 ft. and has accommodation for twenty-four passengers.

From the decorative point of view the exhibition surpasses anything hitherto staged in these buildings. The always difficult problem of combining conventional design with naturalistic treatment has been avoided by leaving out the conventional geometric pattern entirely. The entire wall surface of the Garden is a vast scenic painting representing rocky

country, with great distances and a sky which meets the blue gauze which covers the entire roof. The whole effect is magnificently spacious and particularly appropriate to the nature of the exhibits.

"Farm Mechanics" a New Trade

WASHINGTON, March 3—The extensive use of motor trucks, farm tractors, passenger cars and lighting and power systems on farms will soon create a demand for specially skilled "farm mechanics" on farms of 100 acres or more, according to the opinion of the Federal Board for Vocational Training. These "farm mechanics" it is expected will operate and repair all farm machinery operated by gasoline engines.

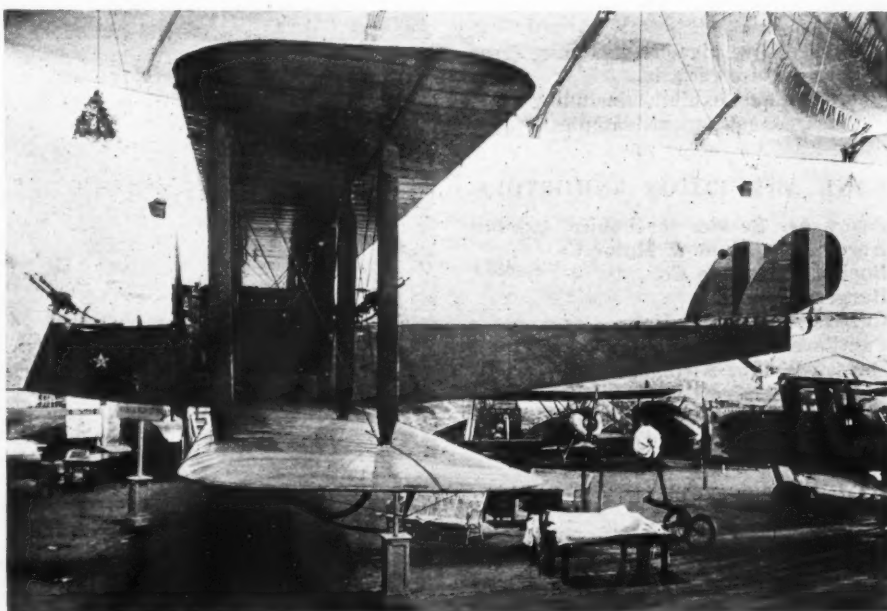
ACCESSORY EXHIBITORS

At the New York Aeronautical Show

The Acleralo Co.
Aero Science Club
Aeronautical Soc. of Amer.
Aircraft Engineering Corp.
Ajax Auto & Sheet Metal Co.
American Balsa Co.
American Bosch Magneto Co.
American Prop. & Mfg. Co.
Anderson Forge & Mach. Co.
Mrs. W. Allen Bartlett
The Bristol Company
Budd Wheel Corp.
Champion Ignition Co.
Class Journal Co.
Cold Light Mfg. Co.
Conn. Aircraft Corp.
Dayton Eng. Lab. Co.
Dayton Wire Wheel Co.
Detroit Accessories Corp.
Dodge Mfg. Co.
Doehler Die-Casting Co.
Dudley, Lee, Tenney & Co.
Duesenberg Motors Corp.
Eastman Kodak Co.
Edison Elec. Appliance Co.
Empire Art Metal Co.

Ericsson Mfg. Co.
Gardner Moffat Co., Inc.
General Ordnance Company
Hart & Hutchinson Co.
Hartzell Walnut Prop. Co.
Hess-Bright Mfg. Co.
Jamestown Propeller Co.
Arthur Johnson Mfg. Co.
Jones-Motrola, Inc.
Junior Plattsburg, Inc.
Lang Propeller Co. of Amer.
Lawrence Aero Engine Corp.
Lawrence Sperry Aircraft Co.
Liberty Starters Corp.
Livingston Radiator Corp.
Lunkenheimer Company
Matthews Bros. Mfg. Co.
A. J. Meyer Mfg. Co.
Mossberg Co., Frank.
Motor Compressor Co.
National Advisory Comm.
National Cash Register Co.
Norma Company of America
Perry Austen Mfg. Co.
Radium Dial Co.
Marlin Rockwell

John A. Roebing's Sons Co.
Schneider Bros. Instrument Co., Inc.
The Simms Magneto Co.
Society Automotive Eng'rs
A. G. Spalding & Bros.
Splitdorf Electrical Co.
Standard Parts Co.
Standard Turnbuckle Co.
Sterling Engine Co.
Stewart Hartshorn Co.
Stone Propeller Co.
Stromberg Motor Devices Co.
Thompson, J. James
Tips Aero Motor Co.
Titeflex Metal Hose Corp.
Torrington Co.
Triplex Safety Glass Corp.
U. S. Ball Bearing Mfg. Co.
U. S. Light & Heat Corp.
Valentine & Company
The Van Sicklen Co.
Wellington-Sears & Co.
Macomber White
Wyman-Gordon Co.
Zenith Carburetor Co.



The big Glenn Martin bombing plane which confronts the visitor at the entrance of the show. It has a span of 71 ft. 6 in. and is equipped with two Liberty engines

Worthy Merchandising Features at Kansas City Tractor Show

Cutaway Chassis—Better Painting and Well Arranged Booths

By David Beecroft

KANSAS CITY, MO., March 1—More attention to the merchandising of tractors was shown by the manufacturers at the Fourth National Tractor Show this year than at any previous show, and if the spirit that was evidenced here is carried on as it should be, it augurs well for a high standard in the future.

Several exhibits are deserving of special mention. They were good in themselves and their influence on the show was splendid. They expressed a new thought in tractor expositions. They possessed a practical appeal.

A word of merit goes to the Bates exhibit, which, while unusually attractive, was entirely suitable for the show and carried with it an appeal that must have carried home the new thought of what a revolution the tractor is to work on the farm. It constituted an appealing, well-written chapter on motorized farming. The photographic reproduction tells most of the story.

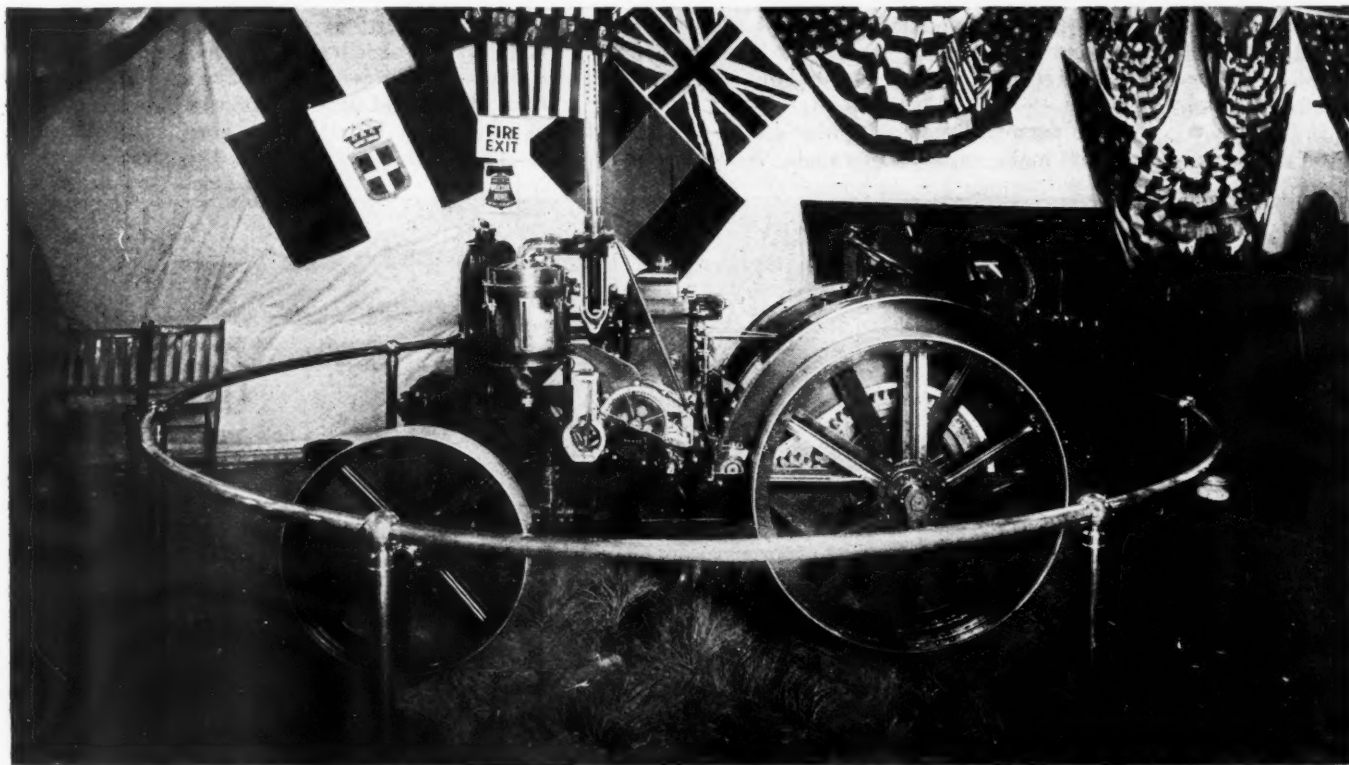
For a total expenditure of scarcely \$300, a plain area of unpainted floor space was converted into a few acres literally extracted from the country. There stood the Bates steel mule in white hitched to a plow in the same color and both in their native element. By means of a platform, a few bushels of good black soil and a few

square yards of real grass that grew greener as the show progressed, it was possible to build up a landscape for which a colored farm scene made a fitting background and completed a typical agricultural landscape of the kind we hope to see in all of our forty-eight states within the next decade. The plows were deep in the furrows. You could scarcely tell where the platform stopped and the painting started.

But this was only a part of the exhibit. To the left of this was a raised platform on which the Bates tractor traveled to and fro from the opening of the show until it closed each day. An electric motor and an automatically controlled switch did the job. It was a fine example of motion in an exhibit.

Clever Cutaway Chassis

To the J. I. Case T. M. Co. goes the credit of staging the first high-class cutaway chassis display ever seen at a tractor show in America. One of the two-plow models finished in gun metal with cutaway sections painted in red and white was mounted on a heavy metal pedestal on which it was slowly revolved by an electric motor. There was another electric motor that propelled the mechanism



The Case tractor with cutaway parts was the finest exhibit of its kind ever seen at a tractor show. The finish on the chassis was as good as any on any automobile chassis at an automobile show

of the chassis so that as it revolved on the pedestal the observer had an opportunity of seeing every portion of it working.

As a cutaway chassis it deserves the highest praise, and as an effort to bring class into the tractor industry and impress on every one that the tractor is a beautifully designed, well-finished engineering job, the work could scarcely have been done better. The castings were cut away to show practically every bearing used in the gear-set, transmission system and axles. Never did a motor car chassis go to a New York or Chicago show better worked out to carry its merchandising message.

Surrounding the exhibit with a brass rail permitted many to examine the chassis from all sides with equal ease and satisfaction. It is impossible to think of a better way to disclose good workmanship and design; and where a maker puts these assets into his product he is losing possibilities if he does not follow some such scheme as this to carry the message into the hearts of prospects. We do not know what this exhibit cost, but as a factor in elevating the standard of tractor exhibitions and as a means of silently telling to farmers and dealers the status of tractor design it is unparalleled.

The Value of Color

A new thought in tractor merchandising was expressed by J. B. Bartholomew of the Avery Co., who had the complete line of Avery tractors and cultivators painted white, with gold striping. It represented a great improvement over the implement red that is too frequently seen on tractors. This Avery act recalls a story told by C. F. Kettering, inventor of the many Delco systems, including Delco light. Kettering had an investigation made before putting out Delco light to discover the color of paint most used on farm implements and most asked for by farmers. The majority favored red. That settled it with Kettering. He would paint his Delco light apparatus any other color but red. It simply must not be red.

Here is why: The Delco apparatus was the highest class piece of apparatus Kettering could build and he decided that if it ever went onto the farm painted implement red it would be treated just as any other bit of farm machinery painted red.

It must not go on the farm as such. It must go as a high class job and it must make an appeal as such. There

is a strong silent message in the color a machine is painted and if the Delco light was to be cared for as it should and respected as it should then such a continual command should come from the apparatus because of its color. At least color should not be a handicap.

There is an application of this in the color of tractors. The tractor must not fall into the farm machinery class so far as being cared for on the farm is concerned. It is too expensive a product for that. It must carry an appeal for special care. It must carry an appeal that it is a well-designed, well-built, costly yet efficient piece of machinery. The color it is painted will help immensely.

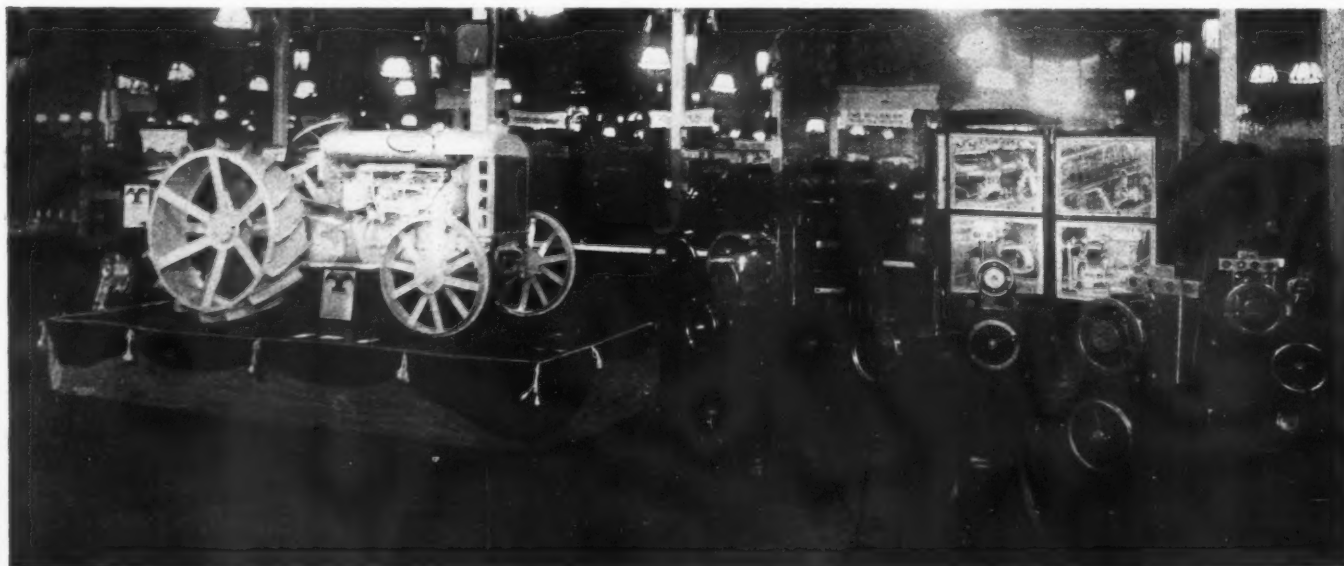
The Avery white line, as it was called at the show, carried a message. There was a good thought back of it, and while tractors would not be serviceable to go into the field in white and gold, the show is a good place to remind the farmer of the value of the machine. The use of white and gold was not limited to Avery, as the American Bosch had a fine exhibit with the center piece in this color, and Bates used it to advantage in his landscape exhibit.

The American Bosch center piece was a Fordson tractor placed on a dais to exhibit its magneto attachment for the tractor. The magneto as well as the gear-case housing the driving gears was in gold. It was the only gold on the chassis and as you passed along the aisle it did not require the services of a salesman to tell you the purpose of the exhibit and explain why a Fordson was in this magneto booth.

Clever Merchandising-Advertising Stunts

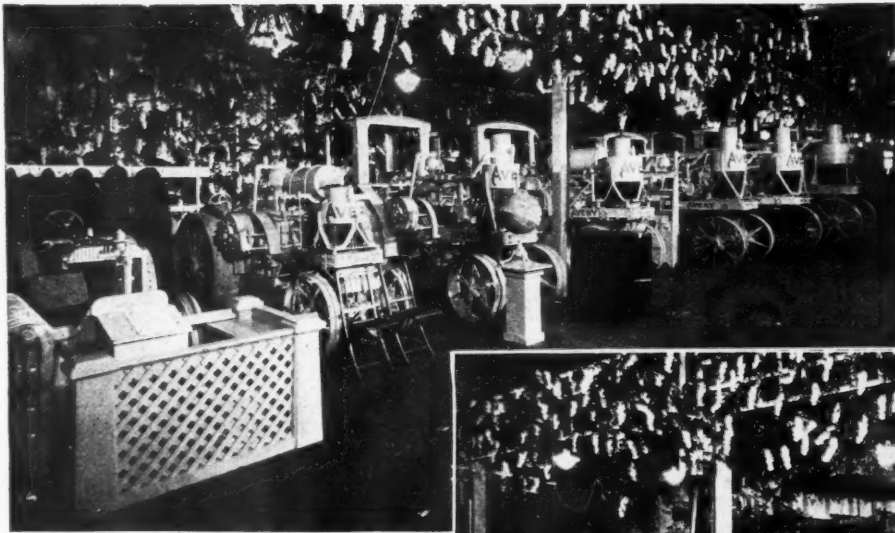
Another excellent bit of American Bosch merchandising was a series of large sized photographs telling in sequence every step you had to take in removing the Fordson timer and mounting the magneto system in its place. The pictures told a better story than any salesman could. They were mounted on a large revolving rack adjacent to the front end of the Fordson.

Hyatt took advantage of the show in a merchandising sense; perhaps it would be fairer to say in an advertising sense. This took the form of a goodly sized brown paper portfolio which was for carrying catalogs. So general was its distribution that everybody carried one under his or her arm and the usual littering of the floor with catalogs was not noticed. Hyatt did a good service to the show by this clever scheme and also did a service to every

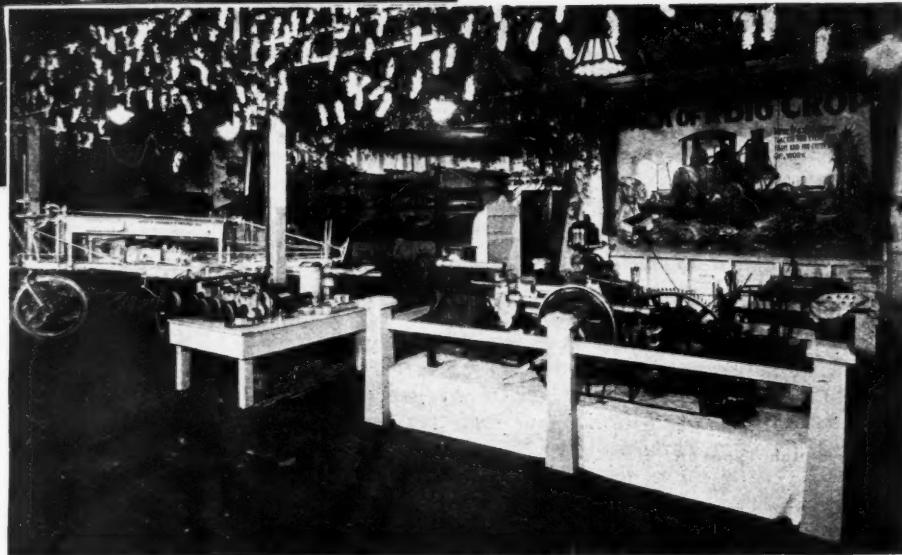


The center of the American Bosch Magneto stand contained a Fordson tractor painted white, with the Bosch magneto in gold, showing all attachment parts

Manufacturers' Merchandising at the Tractor Show



The long line of Avery models was all painted white with gold stripes, a scheme of uniformity not employed by anyone else, and a pleasant change from red so often used



other exhibitor by insuring more catalogs being carried to the thousands of homes represented at the show. It was fitting that such a pioneer in the tractor field should come out with such a generously useful feature.

Credit is due Strom bearings for a clever display of all bearing types and sizes on a large polished wood pyramid. It stood so high that some exhibitors thought it was too conspicuous and lodged a complaint with the show management, but it was permitted to remain. Exhibits of this character add materially to the interest of a show. The exhibit was a duplicate of one which is now being used at the great Lyons trade fair at Lyons, France.

The use of an automatic steering device for the Cleveland tractor was well shown by having the tractor mounted on what was intended to be a plowed field, with the entire steering mechanism carrying a polished finish and the wheels of the steering apparatus resting in a real furrow of earth. It caused everyone to pause, take a look, grasp the story and generally make some favorable comment before passing.

Never before at a tractor show has there been such an effort to make exhibits pleasing to the eye, attractive and also useful from an educational and merchandising point of view. The show has taken a place in the front rank of exhibition merchandising in this respect. Timken had, for example, one of the yokes which carries the creeper of a Cleveland creeper to show how its bearings are used to carry the idlers as well as the sprockets.

The Cleveland company had a similar yoke exhibit to show the improvements that have been made in the sprockets and other parts.

Rock Island had a moving exhibit of its Heider tractor in the form of a back and forward movement of it.

Most of the tractor concerns had their machines driven by electric motors.

There was a lack of uniformity in size of cards giving

information about the tractors, such as rating, weight, price, and a few other essentials. These cards should not necessarily all be the same color but they should be standardized in information given and size.

There is opportunity to make the exhibits of parts such as engines, ignition apparatus, sheet metal goods, bearing materials, castings and other tractor parts more interesting than merely spreading them on the top of a burlap-covered table. That may be the easiest way to exhibit them, but it is far from being the most potential way. Endeavor to put some thought into your exhibit. If you only want it to look pretty without regard to the useful, go ahead and do the best you can. If you want to tell an engineering story think out means of doing it. It may be your mission to incorporate a merchandising story in your exhibit; if so, think out an unusual plan.

Start now planning your exhibit for the fifth tractor show next year. Decide on what message you wish to convey. Make the planning of the exhibit a subject for two, three or perhaps more conferences of factory heads that are interested in the product. Start early.

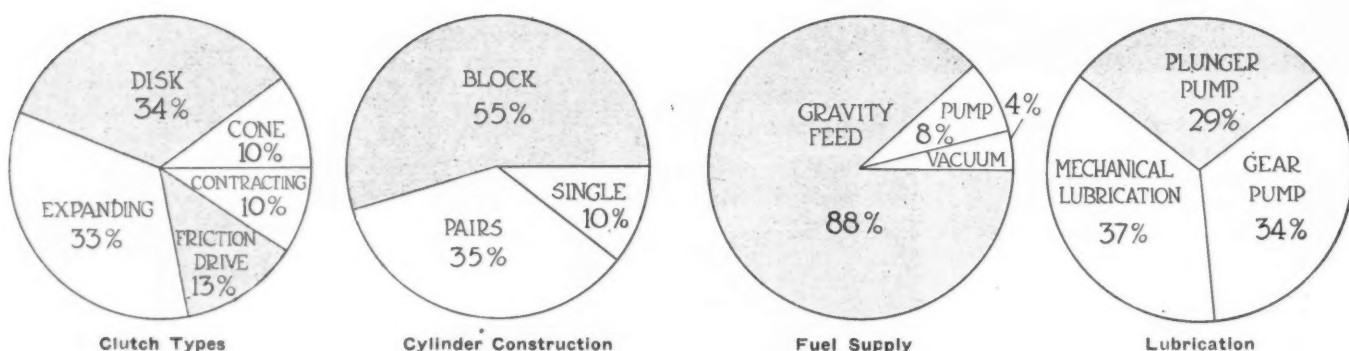
Do your part to elevate the merchandising of tractors and their equipment.

IT is the general view among steel men that the application of the electric furnace in steel refining and steel melting is limited by the cost of electric power. This subject was dealt with in a recent paper by H. Etchells before the Birmingham Metallurgical Society, who said that when electric power was generated with 30 per cent efficiency at the generating station electric furnaces would compete as regards fuel cost with other types. The success of the electric steel-making furnace was due to the utilization of scrap materials hitherto of little value; the production of a class of steel with slightly improved physical properties and of much greater reliability, and easy manipulation and facilities for installing small or large units, as desired.

An Analysis of Tractor Specifications

Showing Representation of Different Features of Design on a Percentage Basis—
Engine Weight Per Belt Horsepower and Per Cubic
Inch Displacement—Average Tractor Weight

By P. M. Heldt



Charts showing the percentage of various constructional features of American tractors

FOR years it has been the custom of AUTOMOTIVE INDUSTRIES to analyze the specifications of automobiles gathered annually on the occasion of the New York Show. The figures thus obtained, showing the prevalence of various practices in percentages, furnish a valuable guide in later years with regard to tendencies in design. In fact, they are about the only basis on which an opinion regarding the trend of engineering practice can be formed. We have often noted how erroneous impressions are obtained from the practice of a few concerns very much in the public eye, which, however, happens not to be in accord with the general lines of progress.

In the following article the specifications of tractors gathered for the Statistical Number of AUTOMOTIVE INDUSTRIES are analyzed. Most of the data collected were published in tabular form, but some had to be omitted from the table on account of space limitations. This is the first time that we are making such an analysis, and, therefore, no comparison with previous practice is possible.

Of the tractors listed 86 per cent were of the wheeled type and 14 per cent of the track-layer type. In the latter class are included both those tractors having tracks only and those running on tracks and wheels.

Three-Plow Preponderates

It was shown some time ago by a questionnaire sent out to farmers in the state of Illinois that the majority of farmers in the corn belt of the Midwestern states consider the three-plow tractor best adapted for their requirements, and the greatest number by far of the tractor models listed are of this capacity. It is quite likely, however, that as many two-plow tractors as three-plow have been manufactured, for, although the number of two-plow tractor models listed is only 13 per cent of the

total, the makers of these tractors include most of the largest producers in the country.

The one-plow tractor has only just arrived and represents only 2 per cent of all the models listed. There are indications, however, that next year's analysis will show an appreciable gain for this type, as there is a noticeable tendency among tractor manufacturers to develop machines that are specially suited to such light farm operations as corn cultivating, seeding, etc., and which when used for plowing must be hitched to a single plow.

The four-plow tractor has a greater representation than the two-plow, namely, 22 per cent, while tractors capable of pulling five or more plows make up 14 per cent of the total number listed.

Engine-Plow Ratio

The writer considered it of interest to determine the average piston displacement of two, three and four-plow tractors respectively. The comparison suffers somewhat from the fact that although most of the ratings are based on 14-in. plows, this does not hold in every case.

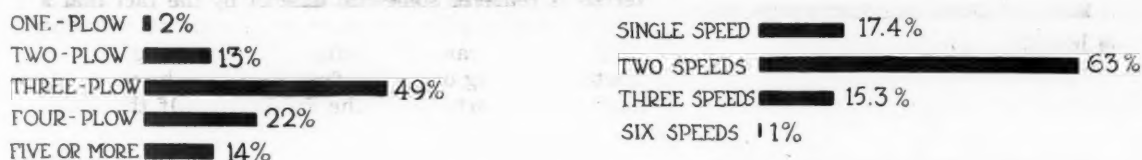
It was found that the average piston displacement of the engines on two-plow tractors is 240 cu. in.

The corresponding figure for three-plow tractors is 370 cu. in.

For the four-plow tractors it is 450 cu. in.

It will thus be seen that the piston displacements are very closely proportional to the working capacity of the tractors and plows, which is as it theoretically should be.

It is a well-known fact that a great majority of modern tractors are equipped with four-cylinder engines, and an analysis of the specifications shows that the four-cylinder and the two-cylinder together practically control the field. Only 1 per cent of the tractors have a single-cylinder engine, and the same percentage is equipped with an eight-cylinder engine. Four-cylinder



Charts based on a count of American-built tractors, showing at the left the relative percentage of one to five-plow sizes and at the right the number of speeds provided in the gearsets

engines are found on 82 per cent of the tractors and the two-cylinder on 16 per cent.

It might be supposed that all of the four-cylinder engines at least were vertical engines, but such is not the case, as is shown by the fact that only 72 per cent of all the engines are vertical, while 28 per cent are horizontal.

The following analysis of the method of casting the cylinders is limited to the four-cylinder engines: It is found that 55 per cent of the total, or a little more than half, are block cast, and 35 per cent are cast in pairs and 10 per cent are cast singly.

Motor Pump Circulation

The statement was made a short time ago in these columns that the thermo-syphon method of circulating the cooling water possessed special advantages when applied to tractor engines. A great majority of these engines are designed to run on kerosene; in order to burn kerosene successfully the cylinder walls must be maintained at as high a temperature as possible without causing preignition, and thermo-syphon circulation tends to keep the temperature of the combustion chamber walls up under certain conditions under which there would be a tendency to over-cooling with pump circulation. However, the figures show that the great majority of the engines used on present day tractors are designed for pump circulation, namely, 93 per cent, while only 7 per cent have thermo-syphon circulation.

Centrifugal Governors Lead

Almost every tractor engine at the present time is fitted with some sort of governor which governs its speed of rotation within narrow limits and prevents it from racing when the clutch is thrown out. Of the tractors listed 95 per cent carry centrifugal governors, 3 per cent hydraulic governors and 2 per cent electrical governors. It is somewhat surprising that no more extensive use is made in tractor practice of the hydraulic governor, as it is certainly the cheapest type to build, and its degree of sensitiveness is easily sufficient for tractor requirements. Of course, the diaphragm would have to be removed occasionally, but this could be done at very little cost and without much trouble.

Tractor engines generally are a much heavier type of engine than automobile engines. This would be shown by a comparison on a piston displacement basis. The greater weight of the tractor engine is due to the fact that its crankcase is usually made entirely of cast iron, besides which the bearings and all other wearing parts are made larger in proportion to the explosive pressure on the piston head. On a displacement basis the four-cylinder engines listed weigh 2.4 lb. per cubic inch. We have no corresponding figure for automobile engines and consequently are not in position to make a comparison. On the other hand, an approximate comparison on the horsepower basis is possible, as automobile engines generally weigh from 10 to 12 lb. per horsepower.

The average weight of all of the four-cylinder tractor

engines is 36 lb. per belt horsepower, showing that the average tractor engine weighs at least three times as much as an automobile engine of equal output. While this difference in weight is largely due to the use of such materials as cast iron in the crankcase and to the provision of more liberal bearing surfaces in the tractor engine, another important reason is the very much lower piston speed of this engine.

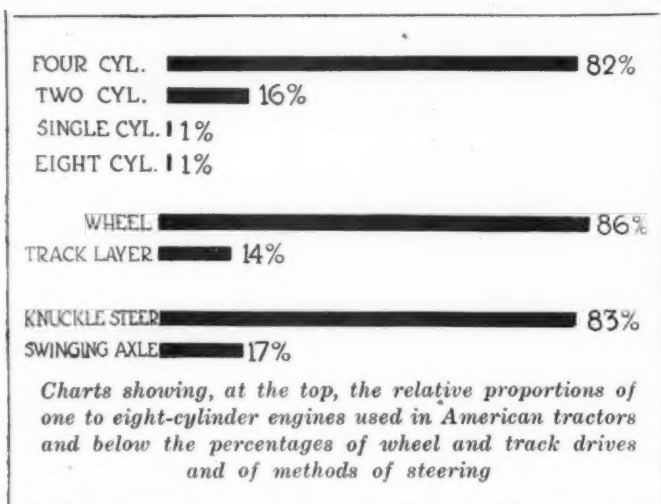
Majority Favor Gravity Fuel Feed

Gravity fuel feed, the simplest system known, is favored by the majority of tractor designers. It is employed on 88 per cent of all tractors, while 8 per cent use fuel pumps and 4 per cent the vacuum system. In the majority of tractors of what may be regarded as the most modern type, in which there is a vertical engine in front, the fuel tank is generally placed directly behind the engine, and can be easily located sufficiently high to insure positive flow under all conditions. The pump system with overflow is an adaptation from stationary engine practice, in connection with which it is used chiefly on account of its inherent safety, as there is no possibility of fuel leakage when the engine is not running. Air cleaners are used almost universally.

The following analysis of the types of oil pumps is given for what it is worth. It was obvious from the replies on the question blanks that many of those who had filled out these blanks did not fully understand the questions. The blanks enumerated gear pumps, plunger pumps and individual pumps, by which latter was meant the mechanical lubricators used on a number of engines, which usually consist of a series of small plunger pumps having a common drive. From the figures collected it would appear that 34 per cent of all the engines were fitted with a gear pump in the lubricating system; 29 per cent with a plunger pump and 37 per cent had mechanical lubricators. It may be pointed out that the comparatively large use of mechanical lubricators is due to the use of kerosene as fuel. This has a tendency to get by the pistons and dilute the lubricating oil in the crankcase, thus quickly depriving it of its lubricating qualities. With mechanical lubricators oil is fed directly to each of the bearing surfaces and no oil is ever used over.

Impulse Starters General

Magneto ignition is the almost universal practice in tractor work, only 3 per cent of the tractors being fitted with battery ignition. All except the very smallest engines using magneto ignition are equipped with impulse starters, which make it unnecessary to spin the engine when starting up in order to produce a spark. There has been much development work done in connection with impulse starters during the past 2 or 3 years. All of the early impulse starters developed for tractor service were of the semi-automatic type in which the impulse mechanism must be set by hand before it will act; but recently the automatic type, which was first brought out for automobile work some 12 years ago, has received renewed



attention. This not only makes it possible to start the engine without spinning it, but also goes into action automatically when the speed of the engine for any reason drops below a certain value, thus preventing stalling of the engine due to inability of the magneto to generate a spark at exceedingly low armature speeds.

It was found that the average piston speed of all of the four-cylinder engines was 860 ft. per minute.

All of the well-known types of friction clutches are used to a greater or lesser extent in tractor work, many of the old line manufacturers producing their own clutches, which are generally of a type familiar in stationary work. Of all of the tractors listed, 13 per cent are of the friction-driven type and consequently use no friction clutch. The various types of friction clutches are represented in the following proportions: Disk type, 34 per cent; cone type, 10 per cent; expanding type, 33 per cent; contracting type, 10 per cent. Most of the expanding clutches are adaptations from power transmission practice.

While the majority of the better known tractors are fitted with variable gears affording two forward speeds and one reverse, there are a great many tractors with both a lesser and a greater number of speeds. Thus, 17.4 per cent of the tractors have only a single forward speed; 63 per cent, two forward speeds; 15.3 per cent, three forward speeds; 3.3 per cent four forward speeds and 1 per cent has six forward speeds.

S. A. E. Standard Belt Speed Too Low

An analysis of the average belt speeds corroborates the opinion expressed at a recent Standards Committee division meeting, to the effect that the S. A. E. standard belt speed of 2600 ft. per minute is too low. The average for the tractors listed is 2725 ft. per minute.

It would naturally be expected that the wheelbase of a machine should increase with the capacity in plows, and the figures at hand show that this is actually the case, though the average wheelbase of all of the three-plow tractors and those of all of the four plow are almost identical. The wheelbase of the two-plow tractors averages up to 83.5 in., that of the three-plow to 96 in. and that of the four-plow to 97 in.

Two general types of steering gear are employed, the knuckle type and the swinging axle type. The latter was universally used on steam tractors and has been adopted by most of the manufacturers who entered the gas tractor industry from the steam tractor field. Knuckle steering is used on 83 per cent of tractors and swinging axle steering on 17 per cent.

An analysis of the tractors with respect to frame materials is rendered somewhat difficult by the fact that a practice has recently grown up of dispensing with the ordinary type of frame extending the whole length of the tractor and using only short frame members by which the engine is supported upon the front axle. Of the total number of tractors, 93 per cent have frames made of structural steel, which in nearly every case is of channel section. Pressed steel frames are used on 3 per cent of tractors and cast frames on 4 per cent. It will be understood that these cast frames are not separate frames, but are constituted by the cases of the engine, transmission and rear axle. This practice of using the cast iron machinery cases for frame purposes is rapidly gaining ground, as it reduces the weight of the tractor.

Driving wheel diameters vary within wide limits, but there is no noticeable dependence of this diameter upon the plow capacity of the tractors, as the average diameter of drivers for the two-plow tractors is 50 in. and that of the three-plow tractors 52 in.

Weights Are Decreasing

Finally comes the weight of the complete machine. This, very naturally, increases with the plow capacity, but not in direct ratio thereto. The average weight of the two-plow tractors is 3670 lb., that of the three-plow tractors 5100 lb. and that of the four-plow tractor 6050 lb. There are strong evidences that the weight of tractors of a given capacity is on the decrease. The refinements in design of various parts all tend in this direction. Lighter wheels result from the use of rolled rims of straight section, and still lighter wheels are obtained by using very thin stock for the rims and securing the necessary rigidity by flanging.

In frames a beginning has been made in the use of pressed steel, which, of course, permits of a considerable saving in weight. The elimination of separate frames tends farther in the same direction.

Determining Center of Gravity

AS the question of how to determine the center of gravity of an automobile has been asked several times recently, and, so far as I am aware, no solution of the problem has been offered, the following may be of interest:

$$P'' = 2400 - 1400 = 1000 \text{ lb.}$$

so by equating the moments we find

$$P'' 60 = PX \text{ and } X = \frac{P'' 60}{P} = \frac{1000 \times 60}{2400} = 25.$$

In order to determine f accurately we must figure $f = 30 - x$ sec. $e = 30 - 25 \times 1.0075 = 4.8125$ "e" being the angle of inclination from the vertical, but

$$\text{Tan. "e"} = \frac{7.368}{60} = .1228$$

indicating that the angle "e" equals 7 deg. and the secant of 7 deg. = 1.0075, therefore $f = h \text{ Tan. } e$ and we have

$$h = \frac{f}{\text{Tan. } e} = \frac{4.8}{.1228} = 39.$$

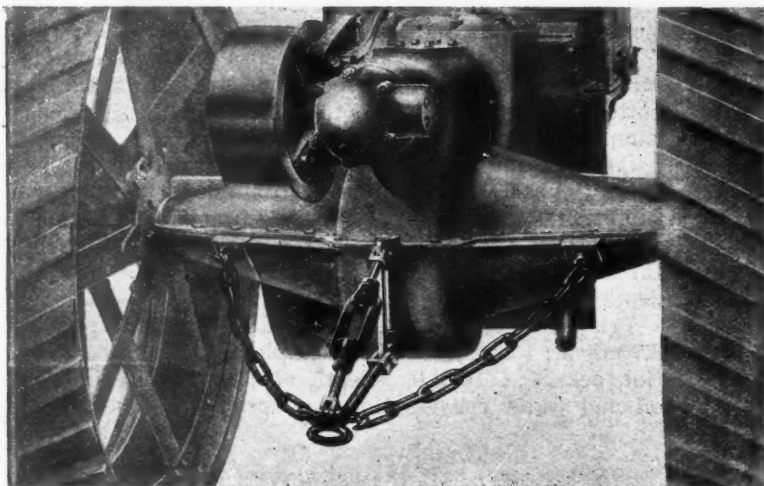
—H. E. PARSONS.

An Analysis of the Hotchkiss Drive

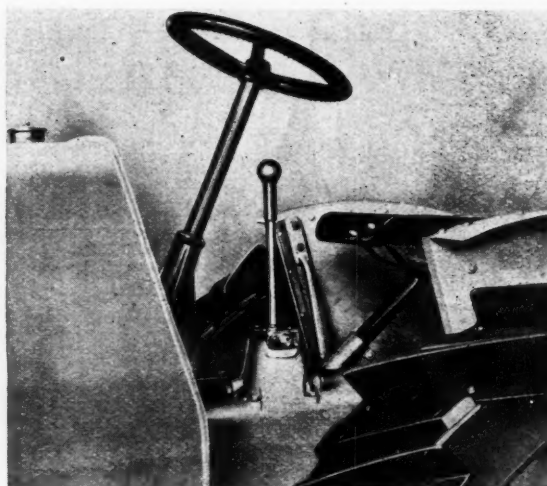
THERE exists a great deal of misconception in regard to the stresses imposed on the springs of motor vehicles if the torque member is eliminated.

In an article published in AUTOMOTIVE INDUSTRIES of Jan. 23, 1919, I presented an analysis of the various forces. In this I misplaced the point of application of one component denoted with P'' .

This error is pointed out by A. W. Happel in your issue of Feb. 20, and I wish to thank your correspondent.—O. M. BURKHARDT.



Rear of the new Fiat tractor, showing redesign of axle housing and present location of the pulley for belt drive



Operator's seat, steering wheel and control elements of the Fiat tractor

Fiat Tractor Design Changed

Secondary Shaft Behind Axle Housing—Straight Belt Drive—
Engine Bore Now 4.1

By W. F. Bradley

AUTOMOTIVE INDUSTRIES' European Correspondent

TURIN, Italy, Jan. 22.—Several changes have been made in the Fiat agricultural tractor since it was described in these columns Oct. 31, pages 772 and 773. On the original design the pulley for belt drive was mounted on the extremity of the propeller shaft, which necessitated the removal of one of the wheels when belt connection was made. In order to make this practicable special jacks were provided. On the machine as now produced there is a short secondary shaft immediately behind the axle housing, on which a 14-in. pulley with 7-in. face width is mounted. This gives a straight belt drive and also makes it possible to tighten the belt merely by moving the tractor ahead.

The engine was originally 100 x 180 mm. (3.9 by 7.08 in.) bore and stroke. The bore has now been increased to 4.1 in. The detailed specifications of the tractor are now as follows:

Total weight	5730 lb.
Maximum height	75 in.
Clearance	15 in.
Drawbar pull, first speed.....	5520 lb.
Drawbar pull, second speed.....	3750 lb.
Drawbar pull, third speed.....	2530 lb.
Wheel track	52 in.
Wheelbase	68 in.
Minimum turning radius.....	122 in.
Front wheel	32 x 48 in.
Rear wheel	51 x 12 in.
Engine, 4-cylinder, 105 x 180.....	18/25 hp.
Diameter of driving pulley.....	14 in.
Width of driving pulley.....	7 in.
Speed on first gear.....	1.2 m.p.h.
Speed on second gear.....	2.8 m.p.h.
Speed on third gear.....	4 m.p.h.
Reverse speed	2.3 m.p.h.
Revolutions of pulley in forward speed.....	100 to 750
Revolutions of pulley in reverse speed.....	135 to 400

During the official plowing experiments a maximum tractive effort of 6170 lb. was obtained on first speed. On a level road no difficulty was experienced in hauling two

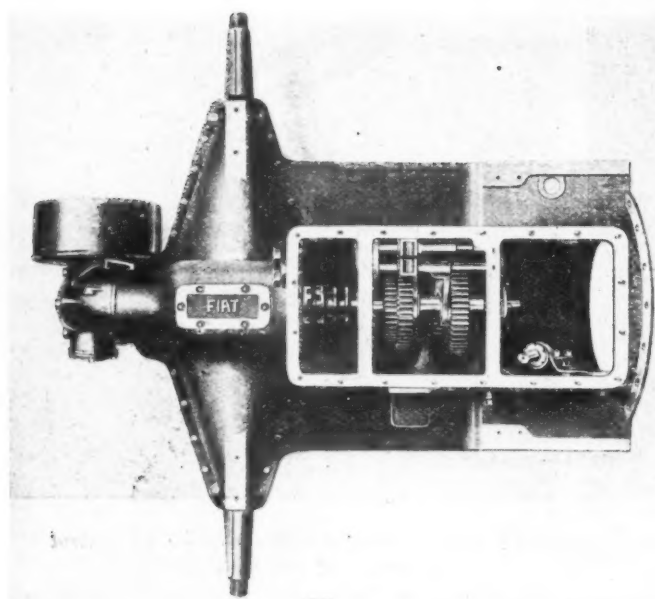
trailers of 10 tons each and on a 12 per cent gradient the tractor has hauled a trailer of 3½ tons.

Some of the practical results obtained in open competition are as follows:

Plowing.—Soil of medium hardness plowed with a three-bottom plow at a speed of 3.7 m.p.h.; area plowed, 7176 sq. yd. per hour to a depth of 7.8 in. The soil having been sufficiently broken during this operation it was not found that the harrowing, which is done as a second



Full rear view of Fiat tractor, showing sturdy construction and symmetry of design



operation, was any longer necessary. Kerosene consumption per hour during this work was 19.8 lb.

Fuel consumption trial at Piacenza on an old meadow to be reclaimed—ground was very hard. Hammer one-bottom plow was used; depth of plowing, 12½ in.; consumption per acre, 40 lb. of kerosene.

Consumption trial at Falchera on a very wet stubble field of maize.—Parling three-bottom plow; kerosene consumption per acre, 25.4 lb.; depth of plowing, 8.6 in.

Trials on a very hard soil at Nichelino with a Parling three-bottom plow.—Consumption per acre, 40.5 lb.; depth of plowing, 9 in.

Trial on easy soil (stubble field).—Speed of plowing, 3.7 m.p.h.; Parling three-bottom plow; kerosene consumption per acre, 16.5 lb.; depth of plowing, 6.3 in. The oil and water consumption per acre was a mere trifle.

Gearset, rear axle and pulley drive of the new Fiat tractor. The 14-in. pulley is driven by a short secondary shaft immediately behind the axle housing. This location of the pulley facilitates fitting the belt and placing the tractor in the best operating position

Bethlehem Four Plow Tractor

A FIRM well known in the truck industry, the Bethlehem Motors Corp., Allentown, Pa., has recently entered the tractor field, having brought out a four-plow tractor with many up-to-date features. It is an assembled product, having a Beaver 4¾ x 6 in. engine, and is rated at 18-36 hp. The total weight of the machine is 6200 lb.

In general layout the tractor is along the most up-to-date lines, there being a short frame in front to which the bell housing arms are bolted. At the front of this frame there are two cross members, the forward one of which has a pivot support at the center of the front axle, while the other cross member, directly behind the first, supports the forward end of the engine on a trunnion.

All four cylinders of the engine are cast in a block, and the cylinder heads are detachable. A centrifugal governor maintains the engine speed at 900 r.p.m. Kerosene is the fuel used normally, and a supply of 14 gal. can be carried in the tank directly behind the dash board. This tank also has a compartment for gasoline for starting, of which a supply of 4 gal. can be carried. All air entering the carburetor has to pass through a Bennett air cleaner, and the air is heated by the exhaust. Ignition is effected by a Bosch high-tension magneto.

The cooling water is circulated by means of a centrifugal pump through the Fedders cellular-type radiator. This is of "armored" design, with cast-iron top and bottom tanks and cast spacers between these tanks. Fuel is fed to the Stromberg carburetor by gravity.

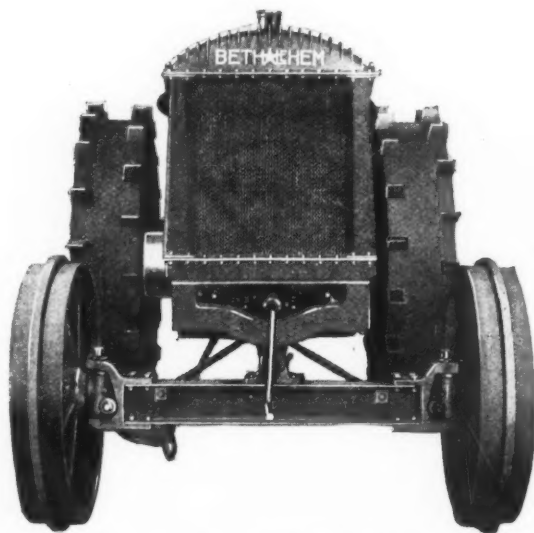
A Hilliard 4 plate clutch is used, together with a Foote sliding gear type of transmission which gives two forward speeds and one reverse, the former being 1.8 and 3.3 m.p.h. respectively. The final drive to the rear axle is by spur gears, and all of the gearing is inclosed. The high gear ratio from the engine to the drive wheels is 42.6 to 1 and the low gear ratio 82.2 to 1. The driving wheels are of French & Hecht make and are 54 in. in diameter by 12 in. width of rim, while the front wheels are 32 x 6 in. Hyatt and Timken bearings are used in the transmission and on the rear axle, while the front wheels have plain bearings. There is a brake drum on each driving wheel, cast directly on the driving spider. The wheels are driven through coiled springs, giving a flexible drive.

Control of the transmission gears is by the selective system, the control lever having an endwise shifting motion and a sideways swinging motion. It works on a quadrant. There is a throttle lever on the bracket supporting the gear control shaft. The clutch is arranged the same as on automobiles, being normally in engagement. It is withdrawn by

means of a pedal located adjacent to the driver's seat.

Two lengths of channel steel are bolted to brackets cast on the rear axle housing and extend backward. These carry a floor board of platform steel. The drawbar is spring cushioned and the point of hitch can be adjusted laterally by means of a U-bolt passing through holes in an angle iron bar supported from the floor beams.

The tractor is steered by means of a hand wheel through a worm and wheel mechanism bolted to the side of the transmission gear housing. The front axle consists of a length of I-beam, to which steering yokes are riveted. The axle is braced by means of two radius rods connecting to a swinging beam having a swivel support at the center of a frame cross member. The radius rods are slightly inclined outwardly toward the front axle. Three point support is used for the engine. A sheet metal hood covers the power plant, being fastened to the dash board and radiator. There is a large opening in the center of this hood, through which access may be had to the overhead valves. The side openings of the engine space can be closed by means of tarpaulin curtains, which can be rolled up and strapped in place to the sides of the engine bonnet when desired.



Front view of the Bethlehem tractor, showing construction of front axle and steering knuckles

Characteristics of a High-Grade Standardized Engine

Greater Efficiency and Smoother Running Obtainable Better by
Increasing Valve Size Than by Increasing Cylinders
—Overhead Camshaft Best

By J. H. W. Kerston

THE successful conclusion of the war and the lessons learned through four and one-half years of concentrated automotive production, with practically unlimited funds available, will make it possible to offer the public machines superior in every way to any pre-war creation.

The influence of aeronautical engine practice will be particularly felt in the design and construction of new automobile engines, replacing the clumsy, heavy engine of yesterday by a high-efficiency, light-weight motor, showing strongly the influence of scientific engineering practice.

Its lighter weight, guaranteeing better all-round efficiency, smaller fuel and oil consumption per shaft horsepower, will benefit the purchaser of a high-grade motor car equipped with such an engine, although the initial cost may be a trifle higher than that of the old-fashioned, heavy engine.

The use of steel for cylinders has been universally recognized as the standard metal for high-efficiency engines, because of its uniform structure and ability to machine the barrel outside and inside. The question in connection therewith remains as to the most efficient cooling of these cylinders—either in a unit aluminum casting or in individual waterjackets. The two recognized standard practices are typified by the Hispano-Suiza and the Mercedes. The American Liberty engine follows the Mercedes practice very closely in this respect, as do also most foreign aviation engines, as well as in the adaptation of the overhead camshaft and valve gear design with rocker arms.

From the point of accessibility, easy machining and interchangeability it must be said that the individually cooled cylinder of the Mercedes type is without the least doubt to be recommended. The aluminum casting may offer smoother lines, more pleasing to the eye, but it is also heavier than a separate cylinder jacket design.

Four-Cylinder Motor the Leader

For a high-efficiency fast car the four-cylinder motor will be in the lead, because of its four-throw crankshaft set at 180 deg., which is always in natural static and dynamic balance. For town driving the six-cylinder engine has many followers because of its throttling ability in congested traffic. V-engines will prove to be a passing fad, dictated by fashion and built to supply the fancy of a certain part of the public, rather than by sound engineering practice, for the horsepower we are accustomed to use for automobile work anyhow.

Much greater efficiency and smoother running will be accomplished by providing larger valve areas than by increasing the number of cylinders. Engines with at least four valves per cylinder will replace the multiple-cylinder engines, because they are lighter, more economical and more efficient.

The overhead camshaft with rocker arms and a vertical driveshaft with bevel gears throughout is the lightest and most efficient drive. This layout also lends itself to a very effective installation of the "accessories"; the magneto driven by a cross-shaft set at 90 deg. to the crankshaft at one end,

the water pump or an additional magneto (for racing and sporting type cars) at the other end of the cross-shaft, form the most accessible installation. Where two magnetos are employed, the spindle of the water pump may form part of the vertical drive shaft. Another vertical shaft below the crankshaft may operate the oil pump. The air pressure pump and the tachometer drive will be most accessible if driven off the rear end of the camshaft. It will therefore readily be seen that in this typical layout the number of driving parts and gears is reduced to a minimum.

The employment of steel will be more general than has been customary heretofore. In an internal-combustion engine stresses for every part can be figured, and those parts can be designed and built accordingly. Steel forgings, so superior to any metal castings, will replace these, as it does away with the factor of uncertainty in castings, and consequently a great many rejections due to defects in rough castings and numerous other defects which do not show up until in the various stages of machining, with consequent additional cost of material, time, labor and depreciation of machinery.

Piston and Exhaust Valve

There are especially two parts in an internal-combustion engine in which other factors besides the imposed stresses are of paramount importance and must be taken into consideration. These are the piston and the exhaust valve. Both parts must be designed with a view of dispersing the tremendous heat quickly; in other words, the thermal conductivity becomes the most important factor. To illustrate the foregoing, a steel piston may be built lighter and stronger than an aluminum casting, yet the additional metal and consequent heavier weight of an aluminum piston is preferable, because it gives the intense heat a chance to disperse all over the heavy section of the piston skirt and from there through the oil film into the cylinder walls and into the cooling water.

The proper design of effective exhaust valves offers a similar problem. However, with provision for ample water circulation around the valve stem, no difficulties are encountered, especially in the four-valve-per-cylinder-head design, where the use of two smaller valves instead of a single large one prevents overheating and consequent warping, usually found in large-diameter valves of the old type.

In this connection another point is apparent. With the employment of two smaller valves instead of a single very large one, lighter valve springs may be used. The next step forward is then the employment of two valve springs for each valve, which has the added advantage of enabling us to use two very light springs of about 20 to 30 lb. pressure each, instead of one large and extremely stiff spring of, say, 65 to 85 lb. pressure. These stiff springs are, of course, more liable to breakage at high speeds due to crystallization of the steel, and at certain critical speeds synchronism of the spring will prevent the proper seating of the valve stems on the cams.

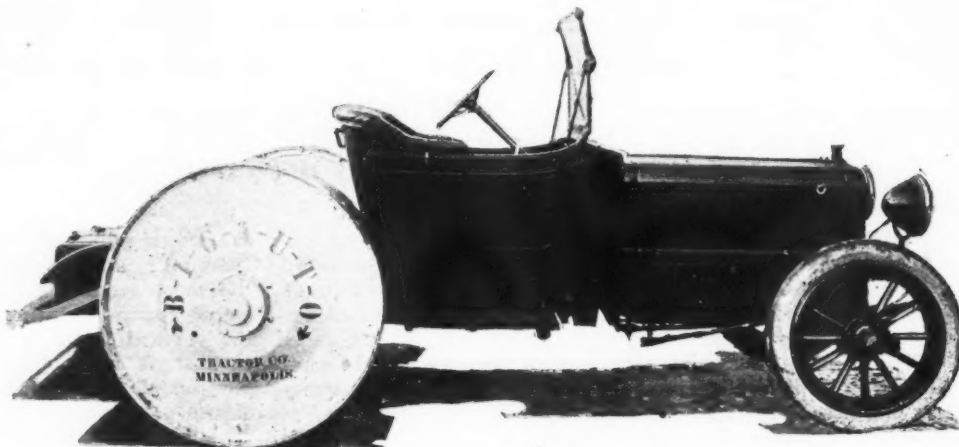
(Continued on page 549)

The Big Auto Tractor Attachment

A Conversion Unit for Converting Large Touring Cars of Older Models Into Farm Tractors—Outfit Weighs About 2500 Lb.

TWO or three years ago, after the truck conversion unit for Ford cars had proved a great commercial success, similar units designed to convert Ford cars into farm tractors were placed on the market. These, however, do not seem to have proved as successful as the truck attachments, and little has been heard of them recently. One of the reasons undoubtedly is that the Ford passenger car engine hardly has sufficient power for operating even a two-bottom plow, if the soil is at all heavy.

More success is likely to attend the effort to introduce a conversion unit for automobiles of larger type. Large touring cars of either the four or six-cylinder type, such as sold about six years ago at from \$2,000 to \$3,000, can now be "picked up" at a relatively low price. They are not sufficiently up-to-date to suit the requirements of the original owners, and they do not appeal to the man who is looking for a second-hand car because of their high cost of operation. The power plants of these touring cars usually are powerful and sturdy, as are their transmissions, and the material used in these machines was of the highest grade. Therefore, provided the engine is of sufficient capacity, so that when drawing its normal rated number of plows it will not be overloaded, and provided it is still in good working order, it should be capable of giving very satisfactory service.

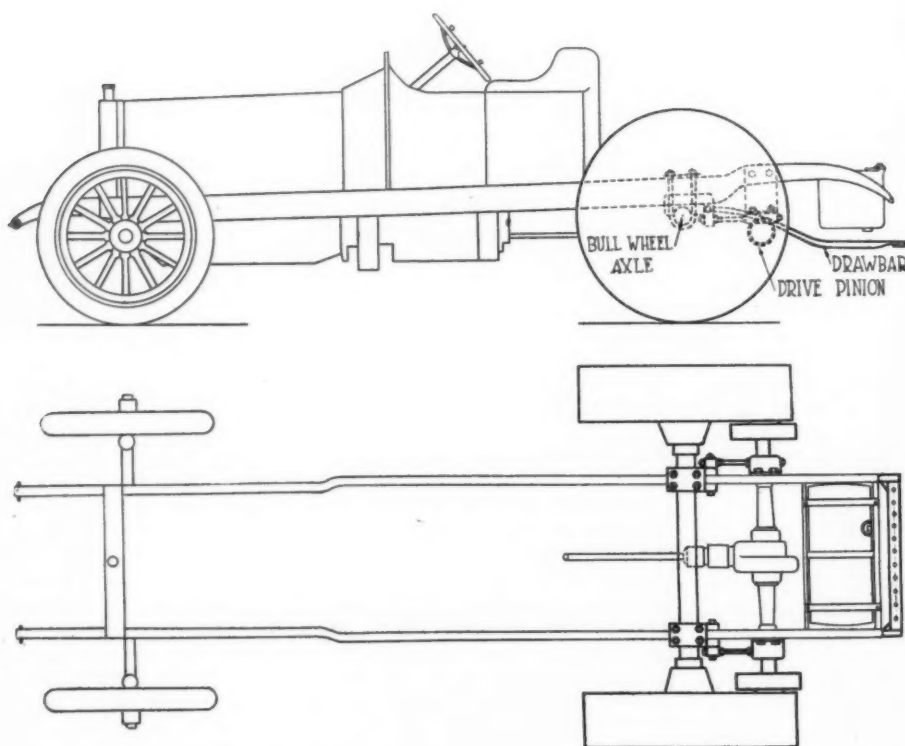


Attachment applied to a Winton car

A conversion unit for transforming cars of the above described class into farm tractors has been placed on the market by the Big Auto Tractor Co., Minneapolis, Minn. Their attachment has been manufactured during the past two years, and has been supplied mainly to farmers who already owned cars of earlier models which were sufficiently powerful for the purpose. Attachments have actually been fitted to the following makes of cars: Glide, Buick, Packard, Russell-Knight, White, Inter-State, Hudson, Locomobile, Stearns, Case and Welch.

The design of the attachment may be studied by means of the accompanying illustration. There are two steel disk wheels, 48 in. in diameter, which are provided with internal gear rings, which are bolted in place. A 14-tooth spur pinion is secured to each end of the axle shaft, after the rear wheels have been removed. As the seat of the driving flanges or rear wheel hubs differ in all cars, these pinions have to be fitted separately for each make of car. To the car frame, ahead of the rear axle, is secured a 9-in. channel steel beam, to which is bolted a heavy cast iron bracket which receives the 3¼-in. round axle, the latter being closely fitted and pinned in place. This bracket is also trussed by means of two tie rods underneath. A flange at the rear of the bracket has holes drilled through it to allow of raising and lowering the drawbar, and there is another flange at the bottom of the bracket which has the radius rod connected to it, by means of which the mesh of the gears can be adjusted. A filler is inserted into the frame channels where the brackets go, and is held in place by means of heavy U-bolts. The object of these fillers is to strengthen the frame members. In addition to being adjustable up and down, the drawbar is provided with a number of holes in its transverse member, so that adjustment can be made to shift the draft.

On each end of the main axle is pro-



Elevation and plan of converted machine, showing the general layout

vided a thrust collar which takes the thrusts in both directions. A thrust collar cap is screwed on the outer end of the wheel hub so that the collar may operate in oil. Oil grooves are cut radially into the faces of the thrust collar, and provide for efficient lubrication of the thrust surfaces.

When the conversion from automobile to tractor is made, the rear springs of the car are removed, and are replaced by a heavy plate and angle, which insures a rigid connection between the frame and the spring plate on the rear axle housing. Vibration is taken up on a wood liner. The large roller bearing in the rear axle is utilized to take the pressure due to the transmission of power by the bull pinion. The internal gear ring secured to the driving wheel has 48 teeth, giving a reduction from the car axle of 6 to 1. The drawbar is attached to the axle bracket, and therefore is independent of the car body. It is suggested that a heavy open tool box be carried on the back of the car frame, which comes in very handy in plowing, as extra plow bottoms, chains, etc., can be carried in it.

Old Front Wheels Usually Retained

We understand that most of the users of the Big Auto conversion unit continue to use the front wheels with their pneumatic tires. In some cases these tires are filled with a so-called tire filler, which permits of their use until the tires practically are in shreds. The Big Auto Tractor Co., however, makes a wood felloe with steel tire 6 in. wide, to which is shrunk a skid ring, having a $\frac{3}{4}$ -in. square section. The tire is $\frac{5}{16}$ in. thick. The wood felloe is strongly built up and ironed. These wheels are special and are not included in the regular unit, the price of the wheels depending upon the conditions.

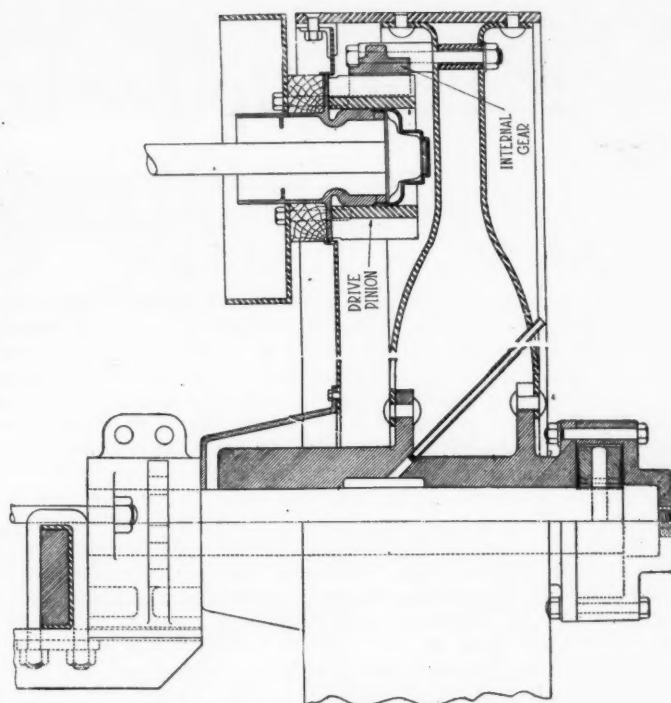
It has been found that when these large cars are used for tractor purposes, owing to the low speed at which they are operated, their cooling equipments are not adequate for the requirements. To overcome this difficulty an auxiliary tank is sometimes carried on the running board. This can be easily attached, and connected up in such a manner that the water circulated by the pump, after passing through the radiator, passes through the auxiliary tank on the running board, and then to the engine jacket. This increases the cooling area as well as the water capacity. To make up for the reduced air circulation, due to the low speed of the tractor, the fan must be geared up higher, which can be done by changing the driving pulley or gear, and, besides, it is advantageous to give the fan blades a larger angle, which can be easily done by means of a wrench. In some cases, where the cooling capacity is far from adequate, an additional fan has been installed in front of the radiator, and provided with a hood, to direct the air and protect the fan.

In designing the driving wheels, special attention has been given to the protection of the pinion and gears from dust and dirt. The gear wheels are protected on the outside by the solid disk of the driving wheel, and on the inside by a steel sheet with an accurately fitting opening for the pinion. This steel sheet does not revolve with the wheels, but is fitted close, and by the use of heavy grease all sand and mud is said to be excluded, the grease also serving as a lubricant for the gear and pinion.

Disk Wheels Stand Hard Service

The Big Auto Tractor Co. states that it developed a disk wheel after having in its early models used various kinds of spoked wheels with ill success. It was found that the spoked wheels would not stand usage on stony roads, but no trouble has been experienced with the steel disk wheels under such conditions.

The weight of the complete conversion unit is 2500 lb., and the average weight of a big car chassis stripped for the tractor as described is also about 2500 lb., making the total weight of the tractor 5000 lb. Of this nearly three-fourths is on the rear wheels, so that ample traction is secured under practically all conditions. It is stated that the conversion of a big car into a tractor by means of the unit described takes a handy man about one day. Occasionally he will require help from another person, especially in lifting. The tractor can be used not only for plowing, but also for hauling purposes, for road building and similar work. It has been found



Section through Big Auto tractor wheel, showing internal drive from old car axle

that the average period of use of a tractor in plowing is only 3 months per year. As the gear reduction from the rear axle to the tractor driving wheels is 6 to 1, and these wheels are larger in diameter than the car wheels, speeds of upward of 10 miles may be obtained with the tractor on the road, if the road conditions permit. With the semi-trailer attached, the tractor can be used for hauling grain and other produce to market. Where heavy hauling is required, three wagons carrying 3 tons each can be drawn by the machine. It is also possible to reconvert the car for touring purposes, but the advantage of this is not emphasized by the manufacturers.

The driving wheels revolve on a solid steel axle and have a bearing surface 16 in. long, which is lubricated by means of grease cups. Two types of lugs are furnished, a cone lug for plowing on sod and an angle lug for use on hard roads and soil. The latter, it is claimed, can be used on any street without damage. Both wheels have holes $4\frac{1}{2}$ in. apart on each side, so that any type of lug can be applied. For use on very light or soft soil, extension rims can be attached.

Editor, AUTOMOTIVE INDUSTRIES: In your issue of Dec. 19, on page 1065, you have a little article stating "Goodyear Patent Is Not Infringed."

In the last paragraph of this you state that Firestone discovered new evidence in the form of a Belgian patent of 1906 and that a replica of the machine, the original having been purchased from Mathern in 1909, was set up in the court room. Now, this part of the information is all incorrect. The Belgian machine, issued under a patent to Mathern, was first introduced in this country by the Hood Rubber Co., who purchased the first machine. The machine was put into evidence, with affidavit of the writer regarding the facts, and was furnished to Firestone for entering into the suit.

The machine, following the decision, has been sold to the Firestone company, so that they could keep it in evidence for future suits.

The right to manufacture under this patent is held by the Hood Rubber Co. in this country. Furthermore, Firestone did not discover the evidence. It was offered to them through our attorney for their first suit in the lower court and was not accepted. There is no question but what the Mathern machine represents the machine building of automobile casings even prior to the time of the Seiberling and Stevens machines in 1904, having been widely operated in foreign countries prior to that time.—Hood Tire Company, Watertown, Mass.

Follow-Up System for Engineering

Checks Up Thirty Jobs at One Time—Cards Arranged
To Indicate All Stages of Work

AN interesting system is in use by the Standard Parts Co., Cleveland, Ohio, to follow-up engineering, or any other work which requires definite steps of progression, from the time it is started until it is completed. The system is simple and at the same time allows an executive to follow up readily the different steps in his work. It is applicable to any kind of executive work, such as sales, production, collection, financial matters, etc. The system was invented by Major Lewis T. Kalb, who has now joined the Standard Parts Co. as an assistant to J. G. Utz, director of engineering. He used the system in the work of the engineering division of the Motor Transport Corps, where the great volume of work necessitated some such method of keeping in touch with the progress on different jobs, and at the same time allowing none to lag. There were over 350 persons employed in the engineering division of the Motor Transport Corps, including draftsmen, clerks, testers, etc., and this system was used for following up the design, testing, sending out of prints and keeping a record of all vehicles used by the Motor Transport Corps.

Kept Record of Thirty Jobs at One Time

By the use of this system as many as thirty different jobs were carried on at the same time and an accurate check-up of the progress of each maintained. In addition to the designed jobs there were perhaps sixty or seventy testing jobs and thirty or forty sets of specifications to get out. Naturally, it is impossible for the head of such a department to carry this work in his mind and some sort of follow-up is necessary. The scheme outlined herewith was found to be very satisfactory and is adaptable to a wide variety of uses. The method consists of the utilization of 5 by 8 in. cards for each job. On one side is typed all of the information pertaining to the work, such as specifications, the date of release, etc. The other side is ruled for a follow-up chart, as shown in the accompanying illustration. The horizontal rulings on the chart indicate the various stages through which the work must pass before it is completed, and the vertical rulings indicate periods of time, such as days and weeks. When the work is started the weeks are typed in, as shown in the illustration, designating each week by the month and date of the first day, or Monday. If the operations are definite and known in advance they may be typed at the time the job is started, or if definite steps are not certain they may be typed in as each successive stage is reached.

As each stage is reached the man in charge of this particular phase of the work is consulted and the probable date of completion is determined. This is shown by a bull's eye on the card. Each day that the work progresses a mark is put

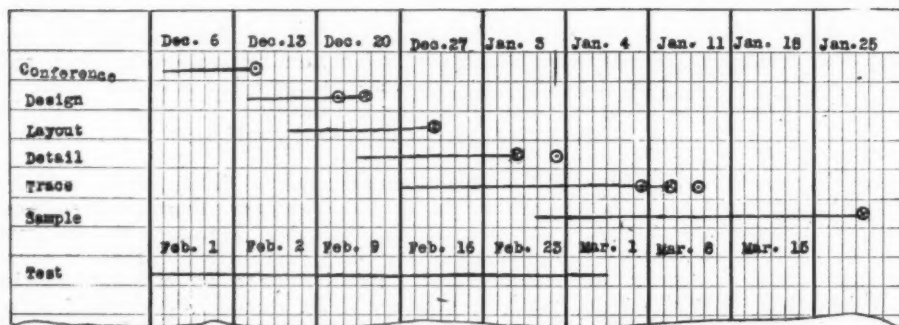
in the space for that day and for that stage of the work. It is thus possible for anyone to determine, by consulting the card, just how far along the job has progressed. It is possible to tell what stage it is in at the present and the probable date of completion, and in fact all of the important facts that the executive wants to know regarding it. The bull's eye makes it possible to check up when any definite period of time allotted for any stage of the work has elapsed and indicates whether that particular department of the work is up to or below its estimate. In this way it is possible to put on more men should they be necessary to insure the job being kept up to program.

It is very common practice not to look for a job until the date it is completed and then to find that the work has been neglected, or shelved for other jobs, with the result that the promised date cannot be met. In addition to acting as a follow-up system, the card also becomes a valuable record and furnishes a ready clue as to what can be expected in future jobs of a similar nature. The system, if desired, could be elaborated to indicate the number of men hours spent on any job, or the card could be used as a time record by key marks for the particular man on the job and accurately telling the length of time spent on the work. If not desired as an accurate time record, it could be used as a check against more complete time systems used by a factory. The real merit of the system is its simplicity and its ability to be used in a wide variety of applications.

Reconstruction Will Demand New Machinery

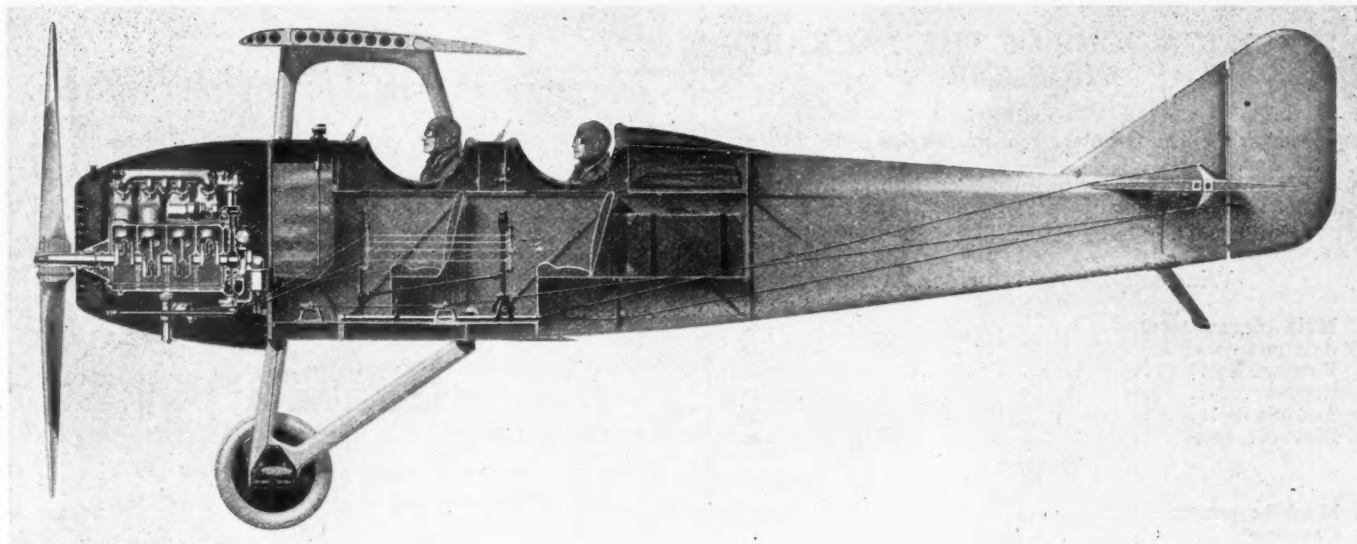
THE Oakland Motor Car Co., Pontiac, will not continue the manufacture of pants. The upholstery department of this concern was turned over to the manufacture of trousers for soldiers' uniforms during the war, but of course is swinging back to tops and seat covers, now that hostilities have ceased. The alterations necessary in getting into the war manufacturing program and back again to a peace basis have furnished an opportunity for revising the equipment which in the stress of previous competition did not exist.

Soon again the material market and the dealer organization will have been swung back into line and the old order of things will, in a large measure, have returned. There is going to be an interval before that time, during which manufacturing methods and machinery are going to be thoroughly rearranged so the best possible conditions for the commercial race will exist. Everywhere in the automotive world, particularly in the passenger car, truck and tractor fields, designers are busy on new products. As soon as these designs are complete and the experimental models have been carefully tested, production facilities must be arranged and manufacture started. This is going to mean the greatest demand for special machinery that the automotive world has ever witnessed.



Typical card of the DeKalb system used for following up engineering and other executive work

AN inquiry has been received for C. K. Salisbury, writer of a letter on constant compression engines which appeared in AUTOMOTIVE INDUSTRIES for Nov. 28, 1918. If Mr. Salisbury will send us his address we will communicate it to our inquirer.



Sectional view through Packard plane, showing location of gasoline tank, baggage compartments, and the control system in pilots' and passengers' seats

Packard Exhibits Its First Commerical Plane

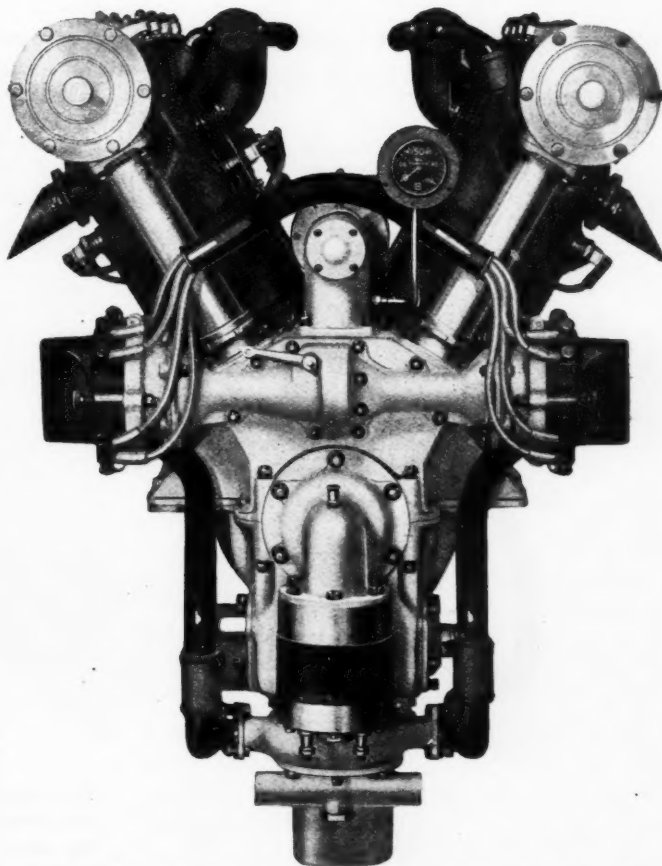
Has Line of Three Engines and Plane Designed to Take Eight-Cylinder Power Plant—To Be Marketed Through Packard Sales Organization

IMMEDIATELY after the armistice was signed the Packard Motor Car Co. began to consider the matter of turning its war experiences in the airplane field into commercial channels. The factory, having been tooled up and laid out for the production of Liberty aircraft engines and having already commenced the manufacture of the La Pere type of plane, found itself in an advantageous position to swing over to commercial airplane production should a demand be found for this product.

Based on the assumption that in this country there are hundreds of wealthy sportsmen to whom flying would appeal, the Packard company has already designed and brought out its first line of airplanes. These will be made at first in limited quantities and marketed through the Packard dealer organization. Some of the dealers have already placed their orders for planes and are now reporting sales to users.

In designing the planes and engines, it has been the aim of the engineering department of the Packard company to incorporate the best features of the Packard and Liberty aircraft engines developed before and during the war. It has been found possible to eliminate some of the objectionable features of the previous types, these largely having to do with installation difficulties. The changes have resulted in a material saving of weight in the completed plane, as well as giving greater simplicity in design and more reliability in performance.

Some of the important alterations may be mentioned. For instance, the carburetor is now located on the bottom of the crankcase, with the necessary intake passages carried through the case. This has resulted in a very low carburetor, making possible the use of simple gravity feed for all types of planes. At the same time the intake



Rear end view of Packard airplane engine, showing mounting of starting motor and generator location in V

SPECIFICATIONS OF THE PACKARD
AIRPLANE

Powerplant

Packard eight-cylinder, 160 hp. engine; 160 hp. at 1525 r.p.m.

Weight, complete with propeller hub, self-starter, battery and engine water—585 lb.

Fuel consumption .50 to .54 lb. per hp.-hr., sea level.

Wing and Control Surface Areas

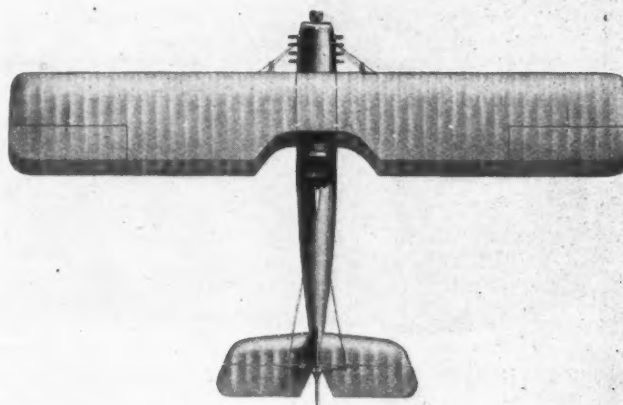
	Sq. Ft.
Main planes, total.....	387
Ailerons, total	48
Vertical fin	5
Rudder	11
Tail plane	30
Elevator, total	22

Weight

	Lb.
Machine empty	1520
Gasoline	210
Oil	30
Water	52
Tools and extras	25
Pilot	165
Passenger	165
Normal flying weight.....	2167
Weight, pounds per hp.....	13.5
Wing loading per sq. ft.....	5.6
Permissible extra luggage.....	100

Performance

High speed near sea level.....	102	m.p.h.
High speed at 10,000 ft.....	98	m.p.h.
Climb to 5000 ft.....	7.5	min.
Climb to 10,000 ft.....	18.1	min.
Climb to 15,000 ft.....	34.5	min.
Absolute ceiling	19,500	ft.
Fuel range wide open near sea level.....	2.5	hr.
Fuel range wide open at 5000 ft.....	3.0	hr.
Fuel range wide open at 10,000 ft.....	3.5	hr.
Fuel range wide open at 15,000 ft.....	4.0	hr.



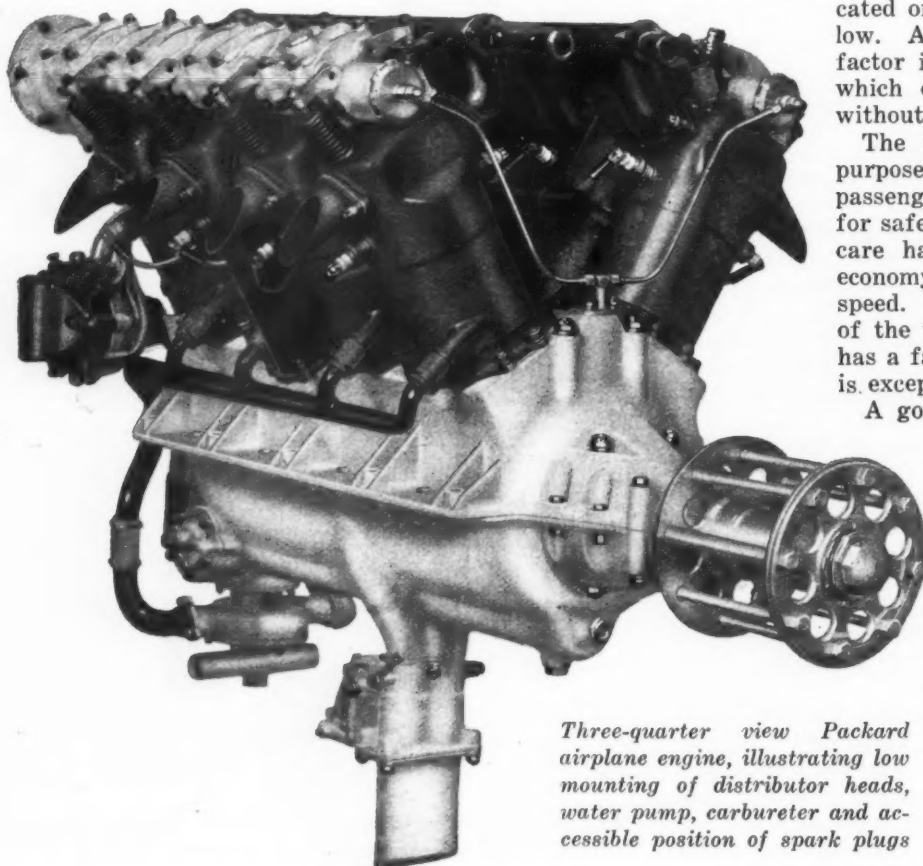
Plan view of the Packard airplane. Note the form of the planes and the visibility from pilot's seat

passages are kept properly warmed and the weight required for water-jacketing the intake is eliminated. Furthermore, removing the carburetor from the V leaves the space between cylinders entirely clear, giving greater accessibility for the spark plugs and providing for unusual vision.

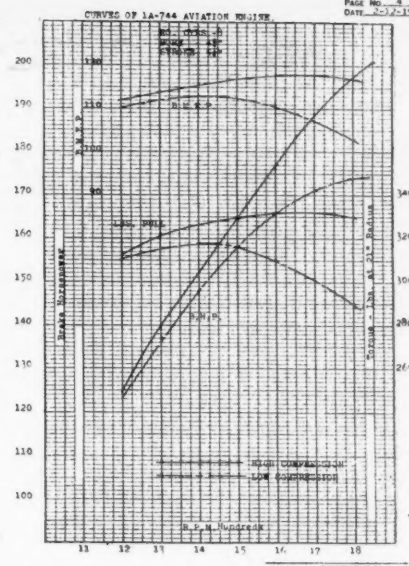
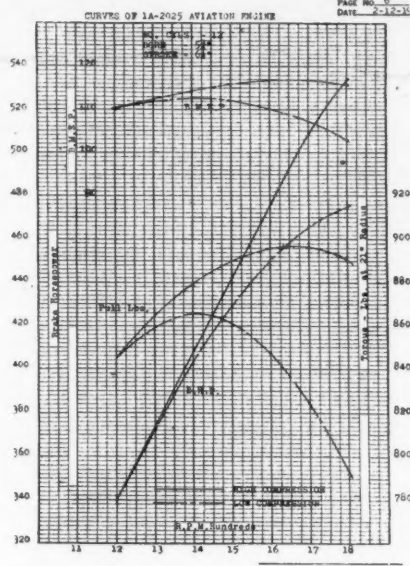
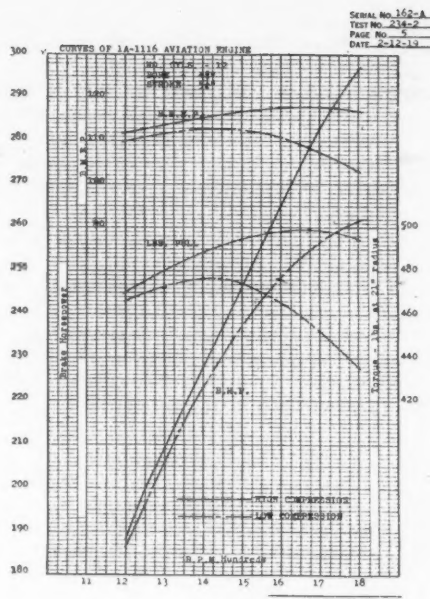
The water pump is located underneath the crankcase. The oil pump is located low down on the left side and the oil pump screen and blow-off valve are also located low on the right side. Another unit to be mounted lower than formerly thought possible is the ignition distributor head, the head for each set of cylinders being located low down on that side of the engine. All of these units are made very accessible for examination or adjustment through convenient openings in the engine cowl. The generator is placed in a saddle carrier in the V and is quickly detached for examination and adjustment. The starting motor is also very accessibly placed, being located on the rear of the engine and quite low. Accessibility has been made a prime factor in the design and there is nothing which cannot be reached with ease and without removing any other part.

The plane, being utilized for sporting purposes largely or for cross-country fast passenger transportation, has been designed for safety and speed, and at the same time care has been given to have reasonable economy and comparatively low landing speed. The plane is designed to make use of the very best materials obtainable, and has a factor of safety of over seven. This is exceptionally high in plane construction.

A good idea of the arrangement of the machine, which is a two-passenger biplane, is given by the sectional illustration herewith. It will be noted that a clothing compartment is provided, also a suitcase compartment to carry two suitcases, which will be found very convenient in cross-country traveling. The plane illustrated herewith has been designed around, and to be a complete unit with, the 1-A-744 engine, which is an eight-cylinder type of 160 hp. at 1525 r.p.m. The general specifications of the plane are tabulated herewith. The per-



Three-quarter view Packard airplane engine, illustrating low mounting of distributor heads, water pump, carburetor and accessible position of spark plugs



Performance charts of the three Packard aviation engines as calculated by the Packard engineering department, based on previous similar designs

formance, as will be noted from the charts, is estimated.

The Packard company is not in production on this plane at the present time, but it will probably go ahead with its manufacture, and in this event, before placing the plane actually on the market, exhaustive sand tests and other tests will be made under official supervision. Before any deliveries are made to customers a sand test will be made on each plane and a copy of the sand test report will be furnished to the purchaser, so that he may be fully informed as to the strength of the various units.

It is estimated that the plane will fly about 100 m.p.h. with full load on account of its comparatively light weight and clean-cut design. The landing speeds have not yet been determined, but it is claimed that they will be quite low and probably about the same as the usual primary training machine. To further facilitate landing in unknown and rough fields, the landing gear is located well forward to guard against nosing over and a rugged tail

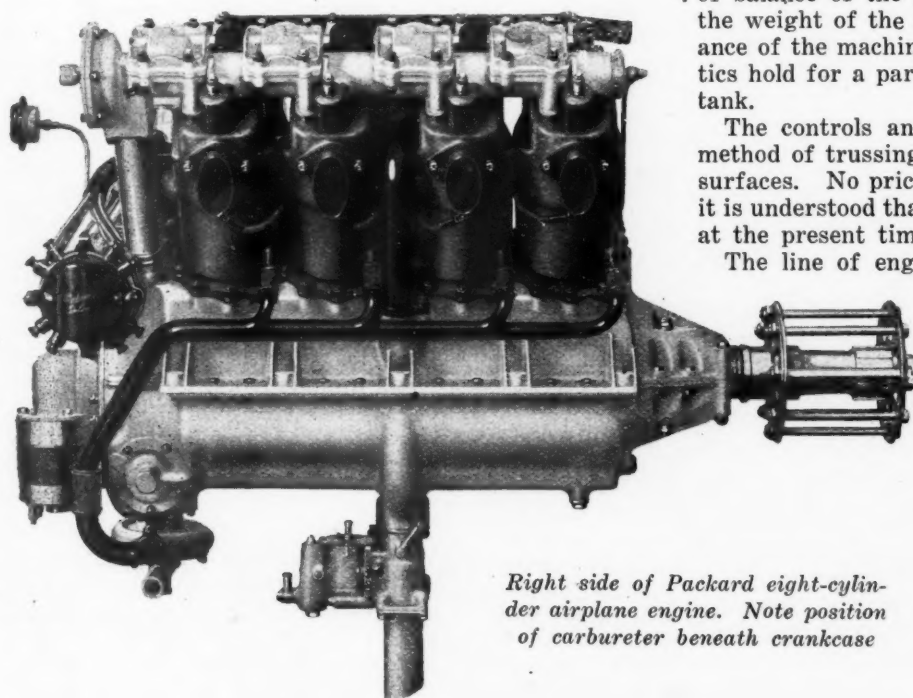
skid is provided to take care of unusual strains and shocks.

One of the features of the plane is the attention given to the comfort of the passengers. For instance, the engine is entirely housed in, making it impossible for oil or gases to blow back in the passengers' faces and the passengers are guarded against drafts by bulkheads on each side. This is a feature which will be appreciated by those who have been out in disagreeable weather.

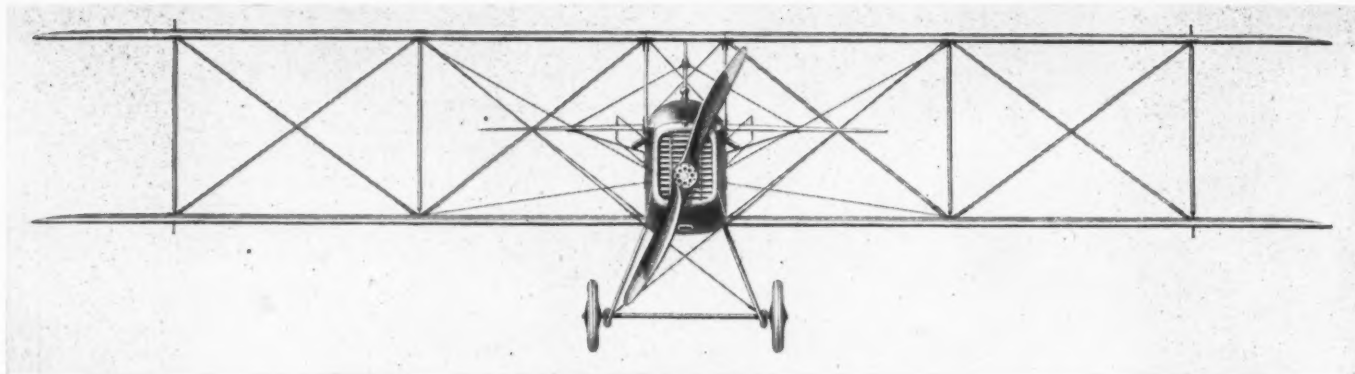
The rear cockpit is arranged especially for the pilot, but the necessary dual controls are provided, so it can be flown from the front seat, thus making it possible to use this machine for instruction work when desired. The controls in the front compartment can be lifted out quickly, making it impossible for the passenger to interfere with the control of the plane, should this be desired. The gasoline tank is located between the passenger and the engine. This location, at approximately the center of balance of the plane, takes care of the variations in the weight of the fuel without interfering with the balance of the machine, so that the same flying characteristics hold for a partially empty tank as well as for a full tank.

The controls and fittings are standard and a strong method of trussing is used to properly support the wing surfaces. No price has been set on the plane as yet, but it is understood that it will sell somewhere around \$15,000 at the present time.

The line of engines includes three models of similar design. Two of the models, known as the 1-A-744 and the 1-A-1116, use the same $4\frac{3}{4}$ by $5\frac{1}{4}$ in. cylinders, the 1-A-744 being an eight-cylinder and the 1-A-1116 being a twelve. In addition, there is a larger engine, using $5\frac{3}{4}$ by $6\frac{1}{2}$ in. cylinders, twelve in number. The general characteristics and arrangement of these engines follow along similar lines. They are all V-type engines having an inclined angle of 60 deg. The eight-cylinder type has a five-bearing crankshaft and the twelve-cylinder design has seven-bearing crankshafts.



Right side of Packard eight-cylinder airplane engine. Note position of carburetor beneath crankcase



Front elevation of the Packard airplane, showing wing span and absence of parasitic elements

In a great many respects the engines follow the design of the Liberty, particularly in respect to the manner of taking the drive off the crankshaft for the overhead camshaft.

The cylinders are of the individual steel type, these having been adopted on account of their lightness and because of the advantages of water circulation and easy valve cooling with this type. The pressed steel jackets are welded on in a manner similar to that employed on the Liberty engine.

The pistons are aluminum die-cast, equipped with a floating piston pin, and an arrangement of rings to prevent fouling of plugs when coasting down from high altitudes. The valve drive is similar to that used in the Liberty engine, being of camshaft and rocker arm type, the drive being taken off the crankshaft by a bevel gear and carried upward through a vertical shaft to the overhead camshaft. The valves are 2 in. in diameter in the clear, with 30 deg. seats. The intake valve lift is 7/16 in. and the exhaust 3/8 in. This large valve size is claimed to produce a very high mean effective pressure even at speeds of 1800 and 1900 r.p.m.

Performance Curves

The performance curves of the various engines are given in the chart herewith for both the high and low-compression cylinders. The brake mean effective pressure curves are shown for both compression ratios. These curves are calculated curves, but owing to past experiences with engines of this type will be found closely to coincide with actual results. The cylinders in this type of engine are exactly opposite each other, as the straddle type of connecting-rods are used, these rods having proved themselves satisfactory in the Liberty and other types of successful war airplane engines.

Lubrication is by full pressure feed, the system being very similar in many respects to the Liberty engine lubrication, the camshafts being taken care of by independent leads through the hollow shafts.

The engine is designed especially for the use of a nose type of radiator, but can be attached to any other type of radiator arrangement. The water pump is driven from the lower end of the vertical shaft and rests horizontally beneath the engine, allowing a straight lead to be carried back from the radiator. The water pump is equipped with an automatic spring take-up for the stuffing box and is readily accessible, due to the fact that it is clear of the engine beneath the crankcase.

Ignition is by the Delco system which incorporates the newest Delco improvement in which the head remains stationary and the spark advance is secured by advancing the drive shaft. Complete double ignition is supplied to two sets of spark plugs and the engine will function properly on either set. The location of the ignition distrib-

utor heads is such as to make them easily accessible from each side of the fuselage.

One of the important innovations in this engine is the location of the carburetor. As is shown in the exterior views of the engine, the manifolding is cast integrally with the lower half of the crankcase, thus permitting an exceptionally low location for the carburetor. Not only is this an advantage from the standpoint of being able to use gravity feed, but it also readily permits of the air intake being carried through the bottom of the plane, thus eliminating any danger of fire in starting a heavily primed engine.

The matter of weight has been carefully worked out in all three engines. The eight-cylinder engine weighs 520 lb. complete; the smaller twelve weighs 710 lb., and the larger twelve 1000 lb. The weight of the engine is given complete with the propeller hub, carburetor, ignition distributor heads, ignition switch, generator, starting motor and starting switch. To this may be added, for engine equipment, 40 lb. for the cranking and ignition battery and the weight of the water system. What this weighs may be judged from the eight-cylinder, in which the water contained in the cylinder jackets, pump and pipes weighs 25 lb. The radiator holds 27 lb., giving the total weight of 52 lb. of cooling water. For the eight-cylinder engine, which uses a 4-in. nose type of radiator of tubular type, the radiator weight is 73 lb.

The engine is 14½ in. from center to center of the bed timber bolts, the extreme width overall being 27½ in. The highest point above the bed timber is 20½ in., and the necessary distance between the radiator and front bulkhead for proper mounting 34 to 36 in., these dimensions applying to the eight-cylinder. On the smaller twelve, employing the same cylinders as the eight, the engine is 12 in. longer. On the larger twelve with the 5¾ by 6½ in. cylinders, the center to center distance of the bed timber bolts is 16¾ in.; the extreme width overall, 30½ in.; the highest point above the bed timber, 23½ in., and the necessary distance between radiator and front bulkhead, from 52½ in. to 54½ in. The nose radiator in the case of this engine is 5 in. thick instead of 4 in., and weighs 110 lb. This is one of the largest aircraft engines designed to date, but it is very compact.

ALTHOUGH all private use of automobiles was prohibited in Great Britain last year, that country imported 193,074,560 gallons of gasoline, an increase of nearly 54,000,000 gallons over 1917.

IN Helsingfors, the capital of the new Scandinavian country, a Finnish Air Traffic Co., Ltd., has been formed, which will in co-operation with the large aircraft producing German firm, A. E. G., run daily passenger and mail services between Helsingfors and Riga, Helsingfors and Petrograd, and Helsingfors-Stockholm via Abo.

The Altitude Engine Test Laboratory

Installed for the Advisory Committee of the Bureau of Standards to Make Tests on Airplane Engines Under Conditions Duplicating Those Met With When Flying at High Altitudes

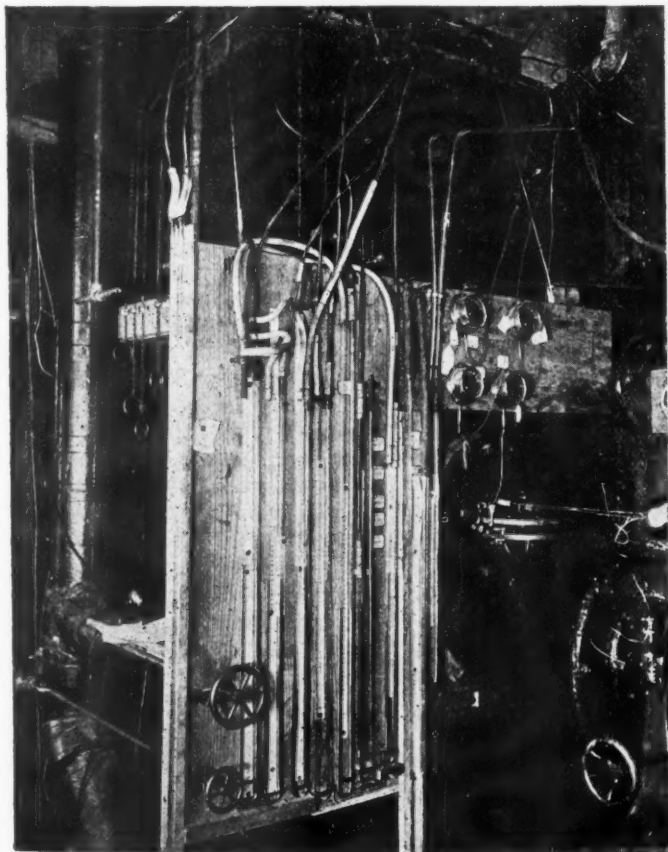
By P. M. Heldt

AIRCRAFT engines are required to operate mainly at high altitudes, and the performance of an engine under the conditions of low atmospheric pressure and temperature obtaining at these altitudes largely determines its practical value for aircraft work. It is as yet impossible to make complete tests on an engine during a flight. After the first experimental models of the Liberty engine had been completed, two sample engines were taken to Pike's Peak, Col., and tested out there. This, however, is a rather remote place, and besides the top of this mountain does not represent the limit of altitude to which airplanes are required to ascend. So it was decided to construct an "altitude chamber" at the Bureau of Standards in Washington in which conditions of engine operation at high altitudes could be closely reproduced. The altitude laboratory was completed more than a year ago, and has been in almost continuous use since, although some changes have been made in the equipment from time to time which facilitate the tests and tend to give more accurate results.

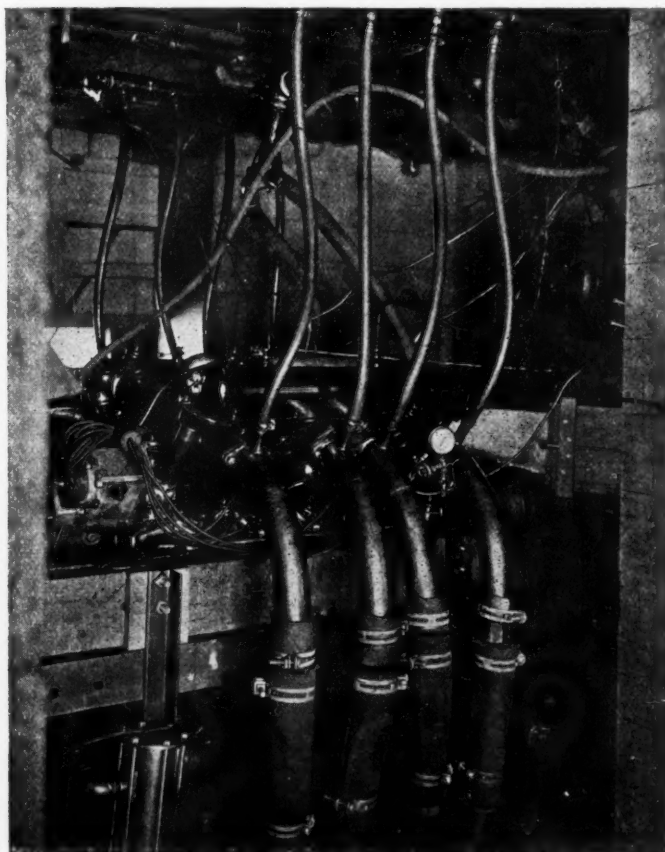
The altitude laboratory consists of an airtight chamber of reinforced concrete from which the air can be exhausted to such an extent as to reduce the pressure within

to about one-third atmosphere, if desired, a centrifugal Nash turbo-blower being used for this purpose. While the pressure of the air within the chamber is being reduced, its temperature is at the same time lowered to a degree corresponding approximately to that observed at the altitude which is to be simulated. This necessitated the installation of refrigerating apparatus in the form of a set of coils located within the chamber, over which the air is passed by means of electrically driven fans. These fans keep the air within the chamber in constant circulation, thus tending to facilitate dissipation of the heat given off by the engine and to maintain the temperature of the air constant throughout the chamber.

The power developed by the engine is measured by an electric cradle dynamometer located outside the chamber, which is connected to the engine by means of a flexible shaft. All of the devices required for making temperature and pressure observations are mounted outside the altitude chamber and are connected to the engine by means of tubes, wires, etc., extending through the chamber wall. Means for the control of the engine are also located outside the chamber, thus enabling the tester to vary the conditions of operation.

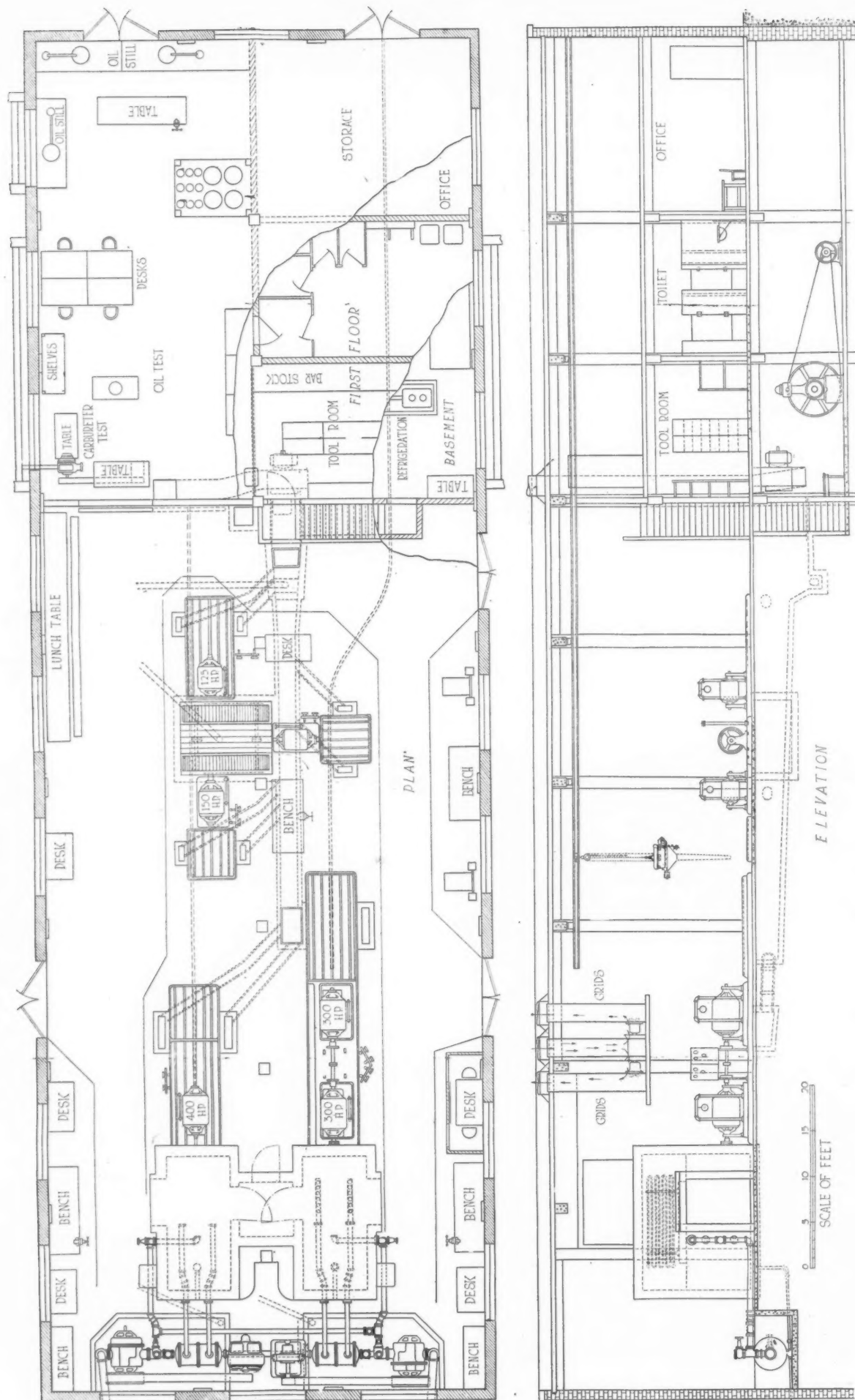


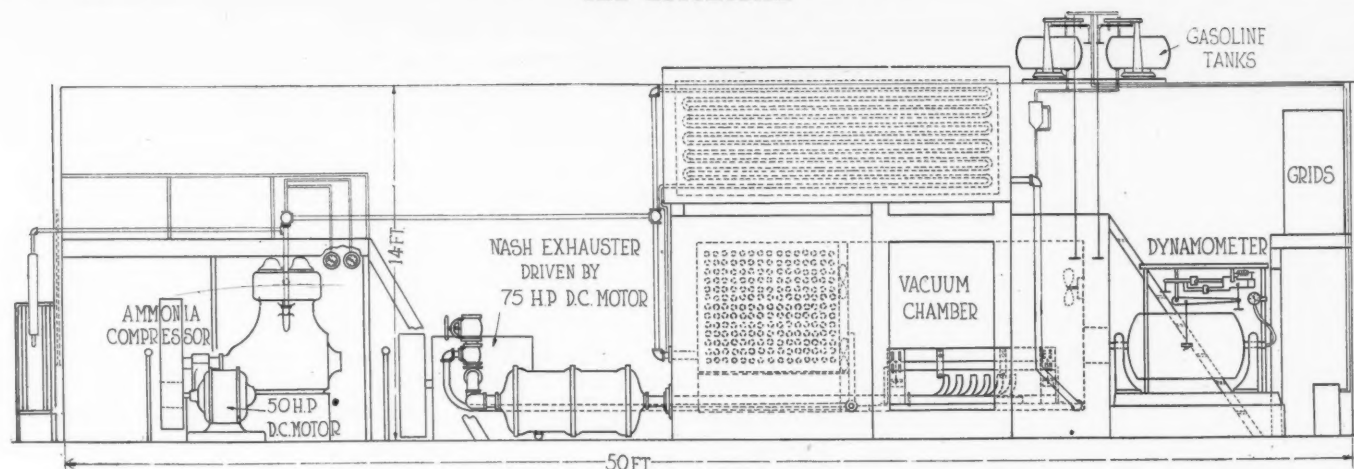
Pressure gage board of altitude chamber



Liberty engine in vacuum chamber

Plan and Elevation of the New Altitude Laboratory





Elevation of the present altitude chamber, Bureau of Standards

Originally, because of the haste with which the installation had to be made, the altitude chamber was installed in a temporary frame and stucco structure 24 x 50 ft. in dimensions. Later on, however, the present altitude laboratory, together with a duplicate one, will be installed in a concrete and brick building especially designed for the purpose.

Roominess Essential

In order that the results obtained may be dependable it is essential that the entire engine should be surrounded by air at a temperature and pressure equal to those at the altitude for which the tests are to be made. This made it necessary to lay out the chamber of such a size as to accommodate the largest size engine which would ever have to be tested, as well as the necessary accessories and auxiliary apparatus. It was further necessary that the chamber should be sufficiently roomy to permit of an operator working around the engine between tests. It was found that this called for a space 6 ft. 2 in. in width, 15 ft. in length and 6 ft. 6 in. in height, and the chamber was accordingly made to these dimensions. In deciding upon the thickness of the walls and the form of construction to use, it had to be borne in mind that with the pressure of the air within the chamber reduced to one-third of atmospheric, there would be a very strong pressure tending to crush the walls in, besides which it was of course necessary to insure airtightness. The walls were accordingly made of reinforced concrete, 1 ft. thick, the reinforcements consisting of $\frac{3}{4}$ -in. steel bars. There are two entrances to the chamber, on opposite sides, each 4 ft. by 6 ft. 6 in. These are closed by doors made up of 2 x 7-in. oak beams spaced 7 in. between centers and are covered on the outside with $\frac{1}{2}$ -in. soft wood boards, over which there is a covering of airproof roofing paper. These doors are swung on hinges and are fitted with heavy rubber gaskets to insure an airtight joint. In designing the doors the possibility of an explosion in the chamber was kept in mind. The oak beams form a sort of grid which is covered by the thin soft-wood boards on the outside, and if an explosion should take place within the chamber these boards would be torn from their framework, thus preventing injury to the walls of the chamber. Each door contains a small window through which the engine can be observed while under test. In order to reduce the transmission of heat, the walls of the chamber are provided with a cork lining on the inside and to minimize air leakage they are painted with heavy asphalt paint on the outside.

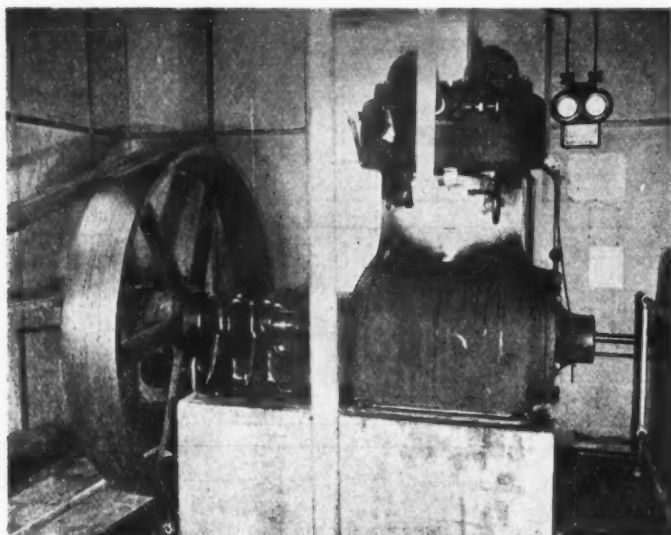
The engine test stand is located at one end of the altitude chamber and the cooling coils occupy the other end.

It has already been stated that all of the engine controls as well as connections to pressure gages, thermometers, etc., are carried through the walls of the chamber. These rods, pipes, etc., must be carried through the walls in such a manner that there can be no air leakage through the openings. To this end each hole is closed by a flange and gasket. This applies also to the larger pipe connections, such as the inlet pipe to the carburetor, the exhaust pipe from the engine and the ammonia pipes to and from the cooling coils.

In designing the altitude laboratory the aim was not only to duplicate as far as possible the conditions of atmospheric pressure and temperature encountered at high altitudes, but also those of the nonrigid engine support furnished by the airplane fuselage. A form of engine support was designed which permits of adjusting the limits of engine vibration in both the vertical and transverse planes and around the three principal axes of the engine. Of course, no reliable data were at hand as to what the amplitudes of vibration in these planes and around these axes amount to in actual flight, so an estimate had to be made, and officials of the Bureau believe that the actual conditions of engine support on an airplane have been very closely duplicated. The engine support may be briefly described as follows: Two 2 x 6-in. oak beams, 6 ft. 3 in. long, are secured to the flooring at their ends. To these are bolted two supplementary beams, of 2 x 4 in. cross section and of a length differing with the engine under test. Where the supplementary beams are bolted to the other beams thin separating blocks are inserted between them. Means in the form of yokes are provided to prevent twisting of the individual beams. While the oak beams forming the base of the engine support were described as of 2 x 6-in. section, this section can be varied, and in this way a change in the vertical and lateral stiffness of the support can be effected. To vary the stiffness of the support as regards rocking motion around the axis of the crankshaft, a third beam of suitable dimensions can be rigidly secured to the yoke rods if desired. This, however, has not proved necessary.

Duplicating High-Altitude Engine Operation

In order to fully duplicate the conditions of engine operation at high altitudes with respect to temperature, it is not sufficient that the air within the test chamber should be cooled to the required degree, but the air drawn into the carburetor must also be reduced in temperature. To produce this refrigerating effect, a two-cylinder, 9 x 9-in. vertical ammonia compressor, having a refrigerating capacity of 25 tons in 24 hours, is installed at one end of the building. This compressor is belt-driven from



Refrigerating machine of altitude laboratory

a 50-hp. electric motor. Next to the compressor is located the ammonia condenser, the plant operating on what is known as the direct expansion principle.

While a single compressor and one condenser handle all of the ammonia used in the refrigerating operation, two sets of cooling coils have to be provided, of course. In addition to the cooling coils within the altitude chamber there are coils for cooling the carburetor air, which are located on top of the altitude chamber. These coils consist of 2000 ft. of 1¼-in. pipe, and are enclosed in a box with 4-in. sawdust insulation. The air, in passing through this box, follows an undulating path, which gives it a better chance to give up its heat to the cooling coils, and from the box the air passes to the inlet pipe connection in the altitude chamber wall through an insulated pipe in which there is a control valve. An air meter is incorporated in the line between this valve and the carburetor.

Five Fans Maintain Air Circulation in Chamber

The other cooling coil, that within the altitude chamber itself, contains 800 ft. of 1¼-in. piping. To maintain a strong circulation of air within the altitude chamber five motor-driven fans are installed, of which four force the air directly over the cooling coils, while the fifth may be used to maintain a strong circulation of air over the engine. The cooling capacity of the coils is such that the temperature of the air entering the carburetor may be reduced to that corresponding to an altitude of 30,000 ft. The air in the chamber cannot be maintained as cold or thin, but can be reduced to below the freezing point with an engine in operation.

However, the refrigerating plant does not afford any means for quickly and accurately controlling the temperature of the air. So, in order to permit a close temperature regulation of the air admitted to the carburetor, this air is passed through a series of electrically heated grids, by means of which its temperature can be raised again. The amount of heat imparted to the air by these grids can be accurately controlled by switches.

Some difficulty has been experienced in the past from condensation of moisture which entered the air after it had been refrigerated, and which occasionally choked the carburetor inlet and the valves. In the new installation it is hoped to overcome this difficulty by passing the air, on its way from the refrigerator to the carburetor, through a settling chamber, through which it

will move so sluggishly that practically all of the snow will get a chance to settle.

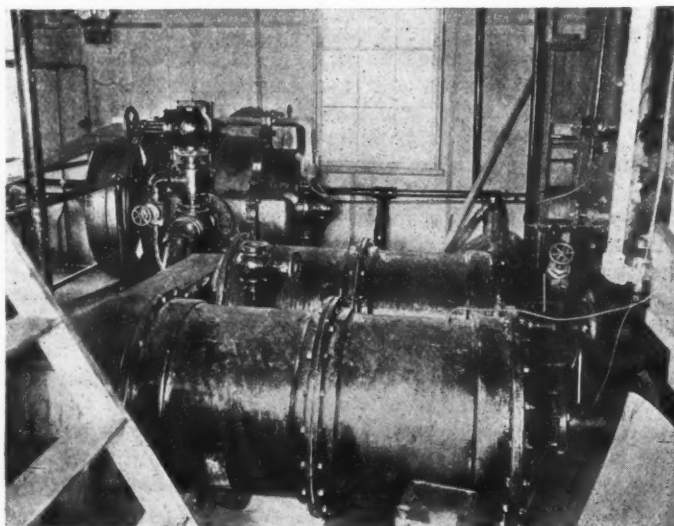
When an engine of several hundred horsepower is being operated at full load in a small closed chamber a great amount of heat is necessarily given off to the surrounding air. In order to reduce to a minimum the heat thus given off to the air within the chamber, the exhaust pipes are water-jacketed. Water is also mixed with the exhaust products in the exhaust pipes, with the object of reducing their volume and thus making it easier to handle them. Just outside the altitude chamber are located two auxiliary exhaust tanks, into which the exhaust products are discharged through two 5-in. pipes. The water condenses in these tanks and is drained off, while the non-condensing gases pass to the exhauster.

Exhausting Into Vacuum

There is one other condition besides those already mentioned which must be fulfilled in order to closely simulate engine operation at high altitudes, and that is that the engine must exhaust into a rarefied atmosphere. It is this condition which makes necessary the use of exhaust tanks. The two auxiliary exhaust tanks are connected to the 6-in. main of the exhaust pump, to which the altitude chamber is also connected by a 3-in. pipe. Hence the pressure within the auxiliary exhaust tanks is at all times substantially the same as that within the altitude chamber. There is a regulating valve on the main, close to the exhaust pump, opening the main to the outside air, by which means the degree of vacuum can be easily and accurately adjusted without varying the speed of the pump.

The exhaust pump used is driven by a belt from a 75-hp. direct-current electric motor, and has a rated capacity of 1500 cu. ft. per minute, with a 12-in. vacuum when running at 300 r.p.m.

All of the gages and engine controls are mounted on two instrument boards at one corner of the altitude chamber. These boards are so arranged that one man can control the operation of the engine and at the same time conveniently read all the gages and other instruments. Following is a list of the instruments on these boards: Five venturi gages for carburetor air inlet, gasoline supply line, jacket water, exhaust cooling water and oil-cooling water respectively. Eight pressure gages, for carburetor float chamber pressure, exhaust back pressure, carburetor choke pressure, average pres-



Exhaust pump and exhaust separator tanks

sure in exhaust manifold, difference between carbureter air venturi and chamber pressures, average pressure in inlet manifold above carbureter choke, difference in pressure between entrance to carbureter and chamber, and difference between exhaust pressure and pressure within chamber respectively; also a barometer, auxiliary barometer, thermometer and indicator showing fluctuation of chamber pressure. In addition to the instruments here enumerated, which may be regarded as part of the permanent laboratory equipment, any gages or indicators forming part of the equipment of the engine under test are also mounted on the instrument boards, as well as an ignition switch and a tachometer.

Measuring Torque

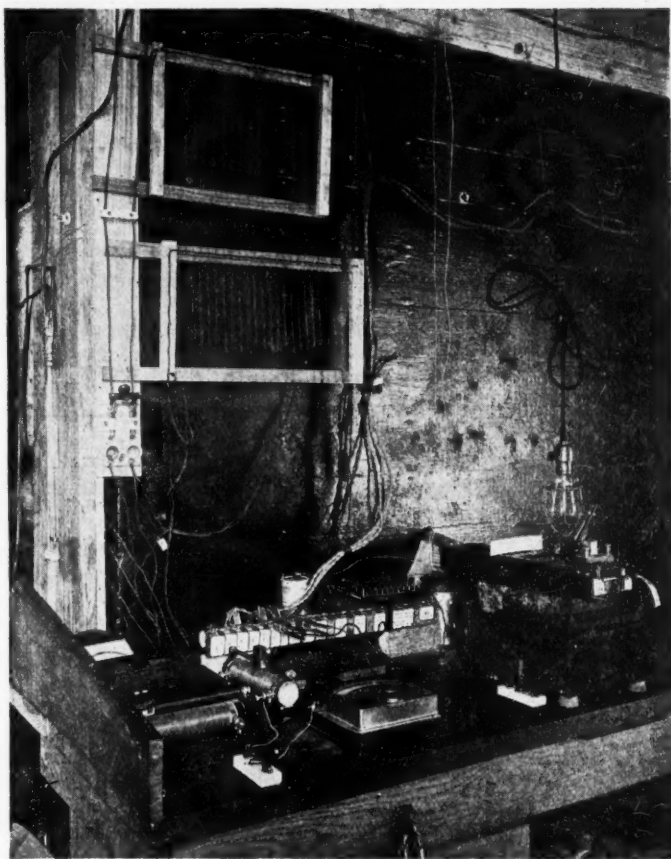
The dynamometer, which is of Sprague make, and of 300 hp. capacity, is of a type that has already been described in AUTOMOTIVE INDUSTRIES. Ordinarily, the torque is measured by means of weights placed on a scale on which rests the torque arm, secured to the field frame of the dynamometer. In addition there is a spring balance which is interposed between the scale beam and the torque arm of the dynamometer, this latter being handy for taking torque readings when no great accuracy is required. The energy absorbed by the dynamometer is dissipated in resistance grids placed outside of the building, or it may be turned into the regular power circuits of the Bureau of Standards. A hydraulic brake is mounted coaxially with the electric dynamometer, and may be coupled to it when it is desired to test engines of greater power than the capacity of the electric dynamometer. The valve for controlling the hydraulic dynamometer is placed close to the switchboard from which the electric dynamometer is controlled.

Duplicate means are provided for measuring the amount of air entering the carbureter. The first consists of what is known as a Thomas meter, an electrical device by means of which the air is heated and the temperature of the air taken before and after passing the heating element. Then from the amount of heat energy imparted to the air, as calculated from the voltage and current consumption of the heating element, the rise in temperature of the air as obtained from thermocouples placed in front and behind the heating element, and the known specific heat of air, the amount of air passing in unit time can be calculated. Changes in the amount of air flow can be compensated for by a change in the electrical energy supply to the heating element or grid, and the temperature rise thus maintained constant. The other means for measuring the amount of air passing to the carbureter consists of a venturi meter, comprising the usual form of venturi tube with connections leading to the instrument board.

Thermocouples Measure Temperature

Temperature measurements are made practically exclusively by means of thermocouples, of which no less than twelve are installed for measuring the following temperatures: Oil-cooling water, carbureter air at entrance to venturi meter, jacket water at inlet, jacket water at outlet, exhaust cooling water at inlet, exhaust cooling water at outlet, altitude chamber temperature, oil temperature at engine inlet, oil temperature at engine outlet, carbureter air between carbureter and air horn, inlet manifold and gasoline.

The thermocouples, of course, are located within the altitude chamber, while the switches and potentiometer of the temperature measuring system are mounted on a board on the side wall of the chamber. In order



Temperature measuring equipment in altitude laboratory

to obviate or minimize the effect of engine vibration on the galvanometer the latter is swung in a cradle mounted on a concrete pier.

Alternate methods are also provided for measuring the fuel consumed by the engine during a test run. One of these consists in the use of a calibrated volume tank, the other in the use of a pair of tanks mounted on platform scales. The first method is used when it is desired to determine the volume of fuel consumed, the latter when the weight is desired. The weighing tanks are most suitable for use in making a continuous test, as one of the tanks may be filled while the other is being emptied. This arrangement is also found very convenient when making a comparison of different grades of fuel. The two tanks are then filled with a standard fuel and with the fuel to be tested respectively, the engine is first run on the standard fuel, after which it is switched onto the tank containing the fuel under test, and after the run has been made on this fuel it is switched back to the tank containing the standard fuel. For the main fuel supply there are underground tanks, while the measuring tanks are located on a platform adjacent to the altitude chamber.

The new altitude chamber now under construction will be a double one, and will differ from the original one in several respects. Instead of placing the refrigerating coil at one end of the chamber it is placed under the ceiling, which allows more space for working around the engine. The two chambers are placed adjacent to each other, and can be brought into communication by opening the two doors at the ends of the communicating passage between them. This permits of testing engines of very much greater output than were contemplated when the original chamber was designed, as both exhaust pumps and both cooling coils can be operated with only a single engine under test.

Benevolent Enterprises and High Wages Offer No Solution of Labor Problem

By Harry Tipper

THE quotation below, taken from the *New York Times* of Friday, Feb. 28, concerning the strike of taxicab chauffeurs, has been called to the attention of the writer with the request that he comment upon this case:

The company has had at all times very radical views with regard to the rights of labor, and it has always paid higher wages and given better working conditions than any other enterprise of a similar character in the city. In order to avoid any injustice, the drivers, encouraged by us, formed their own association, and it was agreed that only members of same could be employed by the company, making it thereby a closed shop in the best acceptance of the term. In addition to this the association collected \$1 a month from each member, and had benevolent features covering sickness and death.

In order to increase the association funds the company itself has donated regularly 25 cents for each dollar subscribed by the drivers. It elects every six months, by secret ballot, its own officers, and it has been a rule of the company that, when a driver was charged with a violation of the company's rules, he was tried before the association committee and representative officers of the company, and a final appeal to the president has always been allowed.

It has unfortunately worked out in practice that this association, created with the best and fairest motives in the world, has failed in its mission, and the elected representatives of the drivers do not, for reasons best known to themselves, assist in arriving at any just and satisfactory verdict on any particular case, but constitute themselves purely and simply, no matter if they know the man before them guilty, counsel for the defense. It has come to such a pass that if a man, after a full and patient hearing, is dismissed from the service a strike is immediately threatened.

There have been several quotations at various times where manufacturers, and other men who are interested in the study of labor problems, have asked for comment upon cases similar to the above, where they allege that the fair and even generous treatment of the employees by employers has not sufficed to institute a stable labor condition and that the demands of the men in the face of such treatment have been manifestly unfair.

It is obvious that this is the case viewed from one standpoint, although conversation with the leaders of the men in most of these cases would indicate that they are not aware of their unfairness, and that they have considered the course of events justifiy it.

It has been pointed out in a number of these articles, however, that labor organizations have been concerned with a growth of control in the government of their own conditions of work, and as their power has grown they have attempted to seize more and more of this control. It has also been pointed out that at the beginning of the

factory system, which arose coincident with the industrial revolution, the employer absolutely controlled all the conditions of work and the employee had no voice at all, even to the slightest degree, in his own affairs. From that time the employer has been concerned with retaining as much as possible of his former control, giving up a point here and there only as circumstances necessitated it.

At no time in the history of the matter, except in a few individual cases, has there been any attempt at agreement, or any desire to arrive at a common point of view on either side, and, in consequence, what may appear to the manufacturer to be fair and even generous treatment of his employees may be regarded by the employees as a merely additional protective measure, or an attempt to fasten the control still more firmly in his own hands.

Labor Takes Improved Conditions for Granted

This is the case to such a degree that no endeavors to improve the housing, the welfare, or the sanitary conditions or to take a benevolent interest in the surroundings of the employees have been of any value in materially altering the labor point of view. It does not appear to be understood by the manufacturer that in the tenets of the labor organization good housing conditions, comfortable living, sanitation and education and a reasonable opportunity for enjoyment are laid down as the rights of the worker. They are not conceded as generosity on the part of the employer but they are demanded by the worker as rights of which he has been too long deprived, and which he is justified in securing and assuring to himself no matter at what cost. It is, however, a part of the creed of the labor organization that the worker should exercise complete control of his working conditions, and this again is demanded by the worker as a right of which he has been deprived and not as a concession which he desires.

In effect, all that the company has done in the case of this chauffeur strike was to create within its own organization a labor union of its own employees to take the place of the general labor union to which the chauffeurs might belong. The encouragement which they have given in the formation of a benevolent association among their men for sickness and death benefits is of no more importance than similar associations in the general labor bodies. The payment of higher wages and even the donation of a certain amount of company funds for this benevolent enterprise are not, in themselves, incentives or a closer co-operation between the employer and the employees, and what is more, a closer study of the history of labor troubles would have informed the company that such benefits to their employees would not in themselves provide any solution for their labor troubles.

To organize employees into a labor organization does not improve their loyalty to the concern. Neither does

it provide any basis for clearing away the suspicions which have been created by the divergent views and traditions, and it does not in the least remove the desire of the worker to exercise a more complete control over his working conditions.

Capital's Disappointment Due to Misunderstanding

It is to be noted that the company has expressed its disappointment at the ungratefulness of the worker, but that expression of disappointment can be attributed to nothing else than a lack of knowledge of the employee's point of view and the history of his organization growth.

An impartial study of the whole development of labor organization, of the history of strikes, both general and individual, would have shown that the improvement of labor conditions from decade to decade did not mitigate the severity of the labor demands in the slightest degree, but only added force to these demands by virtue of the increased strength of the organization.

It is not the change in the physical conditions of labor, nor the payment of higher wages, nor even a degree of paternal interest in the employees' welfare which will have any bearing in the settlement of labor difficulties; for the reason that they simply serve to emphasize the distinction between capital and labor and, therefore, widen the split between employer and employee. They do nothing to clear away the suspicion, the opposing ideas, the misunderstanding which exists on both sides. It is not by such means that the worker and the employer can be drawn together and present a unified organization, working for the common purposes of more efficient production and distribution.

Where this organization has failed to produce harmonious relations between itself and the chauffeurs has been in its failure to recognize the fundamental fact that human unity depends upon a common responsibility, commonly shared.

It is true that the character and class of workers employed in such a company, being as a rule less intelligent than the skilled mechanic and not so well informed, can be dealt with only when greater care and ingenuity are exercised in the formation of the organization, and in the determination of their responsibility in connection with it. This difficulty, however, does not alter the necessities of the case. It merely increases the demand upon the executives, by requiring of them a greater measure of wisdom in their operations, and a much greater degree of patience in working out organization changes so that they have time to go into effect.

It is obvious that where workers are of a less stable character, belonging to the rougher elements, and without the general information which is to be found among the skilled mechanics and similar classes, it requires a great deal more patience and study, and a great deal more time to work out organization changes to the point where suspicion and misunderstanding have been cleared away and confidence has been established.

Wanted—The Labor Point of View

In any case the time for complaint has gone by. Constant reiteration of the fact that the workers' demands are unjust will not improve the situation. Complaint about the attitude of the worker is not only ineffectual but foolish. It is like any other criticism which does not offer any hope of reconstruction. The newspapers carry their news of strikes in different countries; of industrial conferences under governmental auspices in Great Britain; of proposals for the same thing in this country, the breakdown of the industrial system in European countries and of the enforcement of demands by workers which involve political changes.

These things all speak for themselves. They show the necessity for the consideration of the labor question and the consideration of some organization which will offer hope of harmonious relations without the violent overturn that is growing in some parts of the world, or without the extreme political changes which are advocated by large and powerful bodies even in this country.

This necessity for consideration, if the employer of to-day is to find a solution which will permit him to go ahead with his production work, goes right back to the ceaseless human demand for a larger share of responsibility in the government of its own destinies. This demand has been the source of political changes which have given an entirely new aspect to government in the last three hundred years. It has been transferred from political to industrial government, so that the demand of the worker to-day is for more control of his working conditions and more effective political action in respect of his social necessities. This demand will continue to grow unless the manufacturer meets it by arranging voluntarily to follow the action of some of the individual organizations where arrangements have been made to include the worker, through properly organized systems, in the discussions and decisions in regard to matters affecting his working conditions, making him responsible equally with the employer for such conditions and giving him an opportunity to share in some measure the responsibilities and the rewards of the organization.

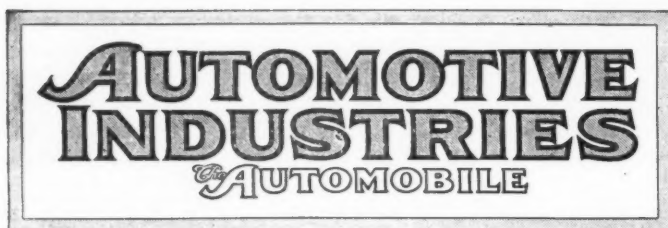
Responsibility and Confidence Demanded by Workers

It is not enough to pay high wages, and it is not enough to invite the worker to share in the decisions affecting his conditions. Responsibility must be given, and the reward for that responsibility must also be included. The most successful operations of this kind have included both, and it is significant that the comment of the workers in these individual organizations has continually opened up with the statement that this organization was "on the square," or "on the level," or some similar expression designating the removal of suspicion.

The most difficult thing to establish and the one thing most necessary in the development of an orderly industrial organization is the demonstration among the workers of the fairness of the company's policy and operations, and it constitutes in the minds of the workers the most important basis for satisfaction, as evidenced by the fact that this point is always brought out by the workers as the first and most important accomplishment.

This necessity for clearing away suspicion and establishing confidence demands a great deal of understanding on the part of the executives or representatives of the employers who have the matter in hand. It demands a study of the reasons for the suspicion, of the ideas which permeate the worker's mind as to what he ought to have and what his rights in the case are. It demands a knowledge of the strength and weakness of the labor movement, and an understanding of the workers which should be keener than any understanding they themselves possess.

The ignorance of labor organization movement, its history and its development and the reasons for its present tendencies which exist among employers, is one of the greatest barriers to any solution of the labor problem which exists to-day. The tendency to regard it in the abstract, to view it entirely from the prejudice of the individual experience, from impressions received through reading more or less inaccurate propaganda, and from the activity of extremists make it difficult to establish any organization methods which will be successful. The attitude toward the matter is then determined by such a background.



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The Consulting Engineer

THERE is need in this country for a broader and more frequent use of the consulting engineer. It is too frequently the case in the automotive industry that a plant does not call in a consulting engineer until it is confronted by some knotty problem in production or design.

It is rare that the consulting engineer is called in to help paint the general picture of what a new model shall be.

The consulting engineer fulfills many requirements in assisting to help solve immediate problems, but this is only one of the ways in which he should be utilized.

The consulting engineer should have at his fingers' ends the best practice used to meet specific problems in manufacture and design, and also he should have a vision which can look into the future clearly enough to ascertain the lines of development and to note in which way the trend lies.

The plant engineer has his mind so closely wound

up in the problems of his own plant that he does not often have the opportunity to acquire the broad vision of the fields which lie within the scope of the consulting engineer. The plant engineer is generally largely concerned with the solution of detail problems, which, while of paramount importance, occupy so much of his time that his opinions should be balanced with those of a well-informed consulting authority.

It is ridiculously narrow for the plant engineer to feel himself slighted if a consulting engineer is brought in. In other professions than the engineering it is common practice to call in consulting authorities. The family physician or general practitioner will always do so when confronted with extraordinary cases.

The small expense required to call in the services of a good consulting engineer is slight indeed when compared with the expense which could be caused by some part going wrong on a big production run. The consulting engineer should be fortified with a thorough knowledge of the weakness and strength of every type of construction. He should know the problems of maintenance which will be involved in any particular kind of products, and he should be able to help solve these problems in a broad way.

Now that the war is over it is realized more than ever that we must improve our products if we are to get a firm grip on the world's market. It must cease to be a question of what we can get by with, but a question of what is best practice to meet a given condition.

Services Should Be Invaluable

The services of a consulting engineer in assisting in the planning of new models along these lines would be invaluable. The consulting engineer should know the requirements of the particular field into which the product is going, and by knowing these he should be able to tell in advance what the problems of service are going to be so that these can be foreseen in laying out the designs, with the result that instead of having to make expensive replacements and having the user always confronted with repair bills, the service will be built into the manufactured article in such a way that necessity for repairs and bills for repair parts will be kept to a minimum.

A big manufacturing organization should not attempt to produce a new model without going outside its organization to call in the services of a broad-minded consulting engineer who is well versed in the particular fields in which the factory is going to enter.

The remark, "A man who turns his key in his laboratory door locks out much more than he locks in," is true. After a rough outline of the future job, no one is better fitted to give advice regarding the method of procedure in manufacture and in the determination of important points than the consulting engineer who has made a study of the field, who knows engineering practice, and who at the same time knows the service requirements and knows the points which should be avoided in that particular type of product.

Tractor Merchandising

ONE of the questions agitating the tractor industry at the present time is that concerning the class of dealers through which farm tractors are to be distributed. There are two main classes from which tractor dealers could be quickly recruited in considerable numbers, namely, the implement dealers and the automobile dealers.

Before going into the respective qualifications of the two classes for carrying on this business it should be pointed out that many of the present automobile dealers in the farming districts are now or were formerly implement dealers. They recognized the opportunity offered by the development of the automobile into a serviceable vehicle and took the necessary steps to profit by it.

On casual reflection it would seem as though the tractor business should fall to the implement dealer who already has business relations with the farmers and sells them all the necessary apparatus for working their farms. There are two reasons, however, which explain why the implement dealer has not proven very successful in selling tractors.

In the first place he is not a very aggressive merchandiser. He is an order-taker rather than a salesman and in competition with the forceful methods which have been developed in some of the newer industries he does not stand a very good chance.

Secondly, the implement man does not thoroughly understand the gas engine and its maintenance and

has no organization capable of giving the service that is required in order to keep the tractor in good working condition without costly and exasperating lay-ups during the working season. It cannot be denied that there have been enterprising men in the implement trade in the past, fully capable of learning the tractor business and of organizing the necessary service force. But most of these were attracted by the automobile business at an earlier date, and those who still remain are for the most part of the conservatively inclined class.

Another angle to the problem of tractor distribution is that tractors and tractor implements must be sold by the same parties. Practically every sale of a new tractor involves the sale of a plow. Other implements specially suited for operation by tractors are rapidly being developed and eventually the business in tractor implements may exceed that in tractors themselves. The question then comes up whether the entire implement business in any locality is to be combined with the tractor business or only the tractor implement business.

One of the leading tractor and implement manufacturers recently made the statement that in his opinion the solution of the problem would be that tractor implements would be handled by the tractor dealer and horse implements by the hardware dealer. Evidently his inference was that the hardware dealer and hardware-implement dealer were not suitable material from which to recruit tractor dealers.

A New Era for the Dirigible

IN warfare the dirigible has proven a less formidable weapon than the airplane, but this is largely due to its vulnerability to attack because of its great bulk and the highly inflammable nature of the gases with which it is filled.

That there are great possibilities in the dirigible airship was also proven during the war, best of all, perhaps, by a Zeppelin which was sent from Bulgaria to relieve the hard-pressed forces in German East Africa with 25 tons of medicines and munitions. It reached its destination and upon learning that the German forces had surrendered returned to its base without even having landed. This round trip is of greater length than the distance across the Atlantic Ocean at the narrowest part.

In considering the dirigible for commercial purposes, its vulnerability to enemy attack is no longer a factor, but there remains that other great danger factor, the highly inflammable nature of the hydrogen gas with which it is filled. This is now in fair way also of being eliminated, for means have been found of producing on a commercial scale an inert gas of low specific gravity, which has hitherto been considered one of the rare elements. Hydrogen has been almost universally used, notwithstanding its fire danger, because of its light weight and consequent great buoyancy. It weighs only one-sixteenth as much as atmospheric air.

The new gas which it is proposed to use as a sub-

stitute for hydrogen is helium, which is found in very small quantities in the air. It has been discovered that this gas is also a constituent of certain natural gases, and the United States Bureau of Mines has been studying means for extracting it from these gases and obtaining it in sufficiently pure form on a commercial scale. These efforts, it seems, have been crowned with success. A plant has already been installed capable of producing 50,000 cu. ft. of the gas per day and the cost is said to be no more than 10 cents a cubic foot, which cannot be so very far removed from the cost of hydrogen.

Although helium has a specific gravity of nearly 4, as compared with hydrogen, the standard for gaseous specific gravity figures, its buoyancy is not so very much less, the buoyancies of the two gases being in the ratio of 15 to 12. The number of Zeppelins that were burned during the war may give a somewhat exaggerated idea of the natural fire risk of a hydrogen-filled bag, for the reason that many of the explosions were due to enemy fire; still, the proximity of a number of internal combustion engines to such enormous quantities of highly inflammable gas constitutes a very serious risk which would have been a great drawback to commercial development. With this risk eliminated the lighter-than-air type of machine may still come into its own in the commercial field.

□ Latest News of the

Contract Validating Bill Signed

Forms and Instructions for Immediate Payments Now Being Distributed

WASHINGTON, March 3—President Wilson last night signed the bill validating so-called informal war contracts which had been made by telegraph, telephone or in other ways not "legally" executed. Payment of these contracts had been refused by the Treasury and the new bill therefore validates them and authorizes payment. The contracts that came under the informal classification totaled \$2,000,000,000, of which more than \$300,000,000 were held by automotive manufacturers. The delay in paying these was said to be one of the chief causes of unemployment, as many manufacturers were unable to secure funds to proceed with peace time work.

The bill as signed following numerous amendments and revisions in Congress provides the Secretary of War power to authorize payment, allows for appeals from his decision to the Court of Claims, insures that sub-contractors be protected by direct investigation by the War Department of all prime contractor's contracts, and limits the filing of claims under the act of June 30, 1919. The Secretary of War is also ordered to report all payments made under the act at the next session after June 30, 1919.

Those contracts which were properly executed prior to the signing of the bill will come under class A and the claims will be forwarded directly to the various claim boards handling the respective products called for by the contracts. For example, an ordnance contract, after being prepared for claim in quadruplicate form, will be sent directly to the Ordnance Claims Board, where it will receive an identifying number, be reduced to certificate form embodying the important details and the award made. No awards will be paid until the approval and acceptance of the claimant is secured.

In those instances where the Government officials decide it is best to make direct payments to the sub-contractors who are interested in the contract of a prime contractor this will be done.

Those contracts which have not been reduced to the proper legal form and which are still merely in the form of a telegram or verbal will come under class B. Special blank forms are provided for reducing these to concrete form. All class B contracts will come before the Board of Contract Adjustments which will investigate their proof of claims and

refer them to the Bureau Claims Board, Ordnance, Air Service or Quartermaster, as the case may be.

In event a claimant is not satisfied with the award of the Bureau Claims Board he may appeal to the Board of Contract Adjustment.

(Continued on page 556)

To Pass on All Contracts

WASHINGTON, March 6—A Board of Contract Review of the Motors and Vehicles Division of the Office of Director of Purchases has been created and will pass on all termination agreements of formal and informal war contracts for trucks, cars, motorcycles, parts and accessories and trailers, before the agreements are submitted to the Claims Board of the Office of the Director of Purchases for final approval. The Board of Contract Review will consist of five members and the Chief of the Motors and Vehicles Division. These will be appointed by the Chief of the Motors and Vehicles Division and approved by the Director of Purchases.

Urge Road Building Program

Conflicting Views on Labor, but Not on Value of Highway Development

WASHINGTON, March 5—Conflicting views of the labor situation and unanimous approval of the value of good roads directly to the public and as a "buffer" employment for labor marked the conference held here this week by President Wilson and Cabinet members with Governors and Mayors of the United States.

Some discussion as to the best methods for reducing existing prices and for maintaining the proper equilibrium of national sentiment on the present immediate problems also took place.

The reports from the Governors or their representatives included 16 states, with a summary as follows:

Arizona—A billion pounds of copper thrown on the market recently have dragged it, with the result that 60,000 miners are working short shifts or are out of work. Buffer, or temporary work, is being rapidly designed to take care of the men, but need of a special agent from the Government to restore the morale of business men is needed.

Delaware—No soldiers who return will fail to find a job. The situation is far more serious. More than \$6,000,000 to be spent on good roads.

Florida—Could use labor if it will work at a fair price. Many projects for drainage and improvements of roads contemplated.

Georgia—Conditions in labor market are generally as satisfactory as could be reason-

(Continued on page 553)

K. C. Show Mecca for Parts Makers

Makers of Tractor Parts Plan for Next Year's Show—Attendance Sets Record

KANSAS CITY, March 5—The closing of the Fourth National Tractor Show here this week turns the attention of tractor and parts makers ahead to next year, when the fifth tractor show will be held here. This will be larger than the present one. Next year's show is already assured and the exhibit of parts, too, will without doubt be much more extensive than this year.

At a national tractor show it is to be expected that all of the tractor makers will be present, but many were surprised at the wonderful exhibit of parts, and almost all of these were from the automobile industry, or, more accurately speaking, the automotive industry.

There were practically all of the makers of ball and roller bearings. There were the makers of magnetos, spark plugs, carbureters, piston rings, radiators, sheet metal goods, engines, bronze materials, castings, lubricants, etc. Makers of stampings were on hand, but not in such great numbers. Some of these have already brought out very light tractor wheels, pressed steel frames, etc., and are preparing to make stampings for other parts.

Exhibits Best Ever Seen

The exhibit of such parts was the best ever seen at a tractor show and was better than any seen in recent years at the New York or Chicago shows. These makers are selling their product in large quantities to the tractor maker.

One manager of a parts organization did not think it necessary to make an exhibit or to bring his engineering representative along. After making one circuit of the show and seeing what a comprehensive exhibit there was of tractor parts he at once wired his factory to send some of his engineers and also men from the sales end to study the field. He was too late for this year but was not going to lose any time.

Being held the same week as the automobile show there was a good attendance of distributors and dealers. The tractor makers have shown good business judgment in holding it this week in order to get the benefit of all of the dealers. Nearly every maker was looking for a dealer. Some placed one or two distributors and appointed a dozen or more dealers. There were many prospects for

(Continued on page 549)

Automotive Industries



Money Provided for Highways

President Signs Bill Appropriating \$200,000,000—Total Available, \$574,000,000

WASHINGTON, March 3—President Wilson has signed the Post Office Appropriation bill carrying an amendment providing for \$200,000,000 to be expended in the next 3 years for road construction. This sum, together with the State appropriations which must meet the Federal funds on a dollar-for-dollar basis, will provide at least \$574,000,000 for highway building before 1922. As most of the States are appropriating sums in excess of the Federal requirements, it is expected that this figure will be greatly exceeded, and, in fact, it appears that this amount may be spent during the year 1919 alone. Reports already received of State appropriations indicate \$385,000,000 already available.

Employment will be given to 100,000 men for the road work, according to a statement by Secretary Houston of the Department of Agriculture Saturday before representatives of the highway departments of 27 States. The secretary said his department would give every aid to the work.

Expect Freight Rate Revision

Complaint was made by the highway commissioners that existing freight rates for road building materials are too high and hamper work. Railroad officials have promised a decision regarding lower rates within 10 days. The conference also asked that engineer regiments now building roads in France be returned at an early date and demobilized so these men could be secured for road work in this country. Secretary Houston promised to bring this matter before the War Department.

An important effect of the new bill is that it broadens the definition of a rural post road and allows the funds to be used for highways where mail may be carried at some future period as well as where it is carried at present.

The act also raises the limit of Government contribution from not to exceed \$10,000 per mile to not to exceed \$20,000 per mile, and further authorizes the Secretary of War to transfer to the Department of Agriculture such road building machinery and materials as are suitable and not required by the War Department.

With the \$200,000,000 made available by the new law, there is not included

\$9,000,000 also appropriated and which will be used for roads and trails in national forests.

The original Federal Aid Road act, passed in July, 1916, appropriated \$75,000,000 for the 5 years ending June 30, 1921, and \$10,000,000 for forest road building. Not over \$3,000,000 of this fund has been spent, due to the war, so that \$82,000,000, plus \$209,000,000, or a total of \$294,000,000, will be available during the next few years. The act and its amendment requires the States to provide at least an equal amount on the post road work.

On page 553 is a table showing approximately what each State will receive in Federal aid under the terms of the act.

American Motors Increases Production

NEW YORK, March 5—The American Motors Corp. is planning an increase of production to take effect in 3 or 4 weeks. The company built 600 cars in 1918 and now plans an output of five a day, and ten a day when the full capacity of the plant is brought into play. A \$500,000 increase in the capital has been made in order to take care of this increase. Leslie F. Smith has become general sales manager. Mr. Smith was supervisor of zones for the Maxwell company and branch manager for Willys-Overland. In 1912 he opened the Oakland branch in this city and later became general manager for ten Southern states. L. P. Rife will become works manager in charge of purchases and production. He was formerly supervisor of production at the Hudson plant in Detroit.

Cross-Ocean Flight Planned

WASHINGTON, March 3—Plans for a flight across the Atlantic are being completed by the U. S. Navy, according to continued rumors here, none of which are as yet confirmed. It is said that the navy will use the NC-1 flying boat and will conduct test flights at Rockaway Point this week. This is the largest American seaplane equipped with three Liberty engines and having a capacity of 10,000 lb., and a present fuel capacity for 1200 miles.

Texas to Have Airplane Company

DALLAS, March 5—Incorporation papers of the Texas Airplane Manufacturing Co. will be filed soon. The company will have a paid-up capital stock of \$1,000,000, and its purpose is to construct and operate an airplane manufacturing plant here. Lt. C. G. Taylor of Lexington, Ky., is chief promoter of the project.

Ford Will Produce \$250 Car

To Withdraw Entirely from Present Company—\$19,000,000 Decision Caused Move

LOS ANGELES, March 5—Henry Ford gave out an interview here to-day in which he stated he would quit the present Ford Motor Co. and bring out a \$250 car. This decision, he states, was brought about by the recent court decision compelling him to divide \$19,000,000 profits.

"I have decided on the new undertaking, and as matters stand I intend to go ahead with it," said Mr. Ford. "This idea developed from the recent court decision whereby I am obliged to distribute about \$19,000,000 accumulated profits. The public will not suffer from this because as a result they will get a better car, a cheaper car and one more fully up to date than before or than is now in existence. The present Ford car was designed 12 years ago.

"The decision that caused me to make this move is because of my principle to have plenty of cash with which to do business. Of that \$19,000,000 I have to distribute to myself about \$12,000,000, but I cannot in justice to myself put that back in the business, because I have no way to oblige those who own the other portion to so employ it.

"My only recourse is to get out, design a new car which can be sold cheaply and which will be in all details up to date. We are already looking for water power sites. The car itself is well advanced, for I have been working on it while resting here in California. We shall have a plant on the coast and stations all over the country. We propose to dot the whole world with our factories because I believe that every family should have a car and this can be done.

"Our tractor factory is paying at the rate of \$500,000 a month. It is capitalized at \$5,000,000 and has accumulated \$12,000,000 assets.

"I do not know exactly what will become of the present Ford Motor Co. The portion of it that does not belong to me cannot be sold to me; that I do know. I must do business on the basis of what I think is right. I do not like stock companies. The Ford Tractor Company stock is all held by members of the Ford family."

DETROIT, March 5—Officials of the Ford Motor Co. will neither affirm nor (Continued on page 556)

Problems of Tractor Design Discussed at Kansas City S. A. E. Meeting

Difficulty of Accurate Tests and Technical Points of Construction Brought Up—Need of Scientific Research Applied to Agricultural Machinery—Standard Fuel Suggested for All Internal Combustion Engines

KANSAS CITY, March 1—The tractor meeting which the Society of Automotive Engineers arranged in connection with the Kansas City Tractor show was held in the auditorium on the top floor of the Sweeney Automobile School on Thursday afternoon and was attended by about 200. To the program of three papers originally published, there was added at the last moment a fourth paper, on "The Re-design of Farm Machinery for Tractor Work," by Prof. White, of the University of Illinois. Unfortunately two of the authors of papers could not be present to take part in the discussion.

How to Determine Drawbar Horsepower

The first paper read was on "Tractor Testing," by Prof. J. B. Davidson of the California State Agricultural College. Prof. Davidson outlined the different tests which it is desirable to make on farm tractors and said that his paper was confined to the subject of field tests.

The drawbar horsepower, which is determined in these field tests, is one of the important elements of the commodity sold by the tractor manufacturer, and is, therefore, worthy of careful measurement. Prof. Davidson referred to the S. A. E. horsepower rating formula and the difficulty which had been encountered in accurately determining the proper rating of tractors. This he said was largely due to the fact that there was no traction dynamometer on the market which permitted of the two-hour test called for by the rating formula. It was stated in the paper that the test horsepower of the 42 tractors tested last summer at Salina varied from 50 to 200 per cent of the rated horsepower. If there were a convenient method of accurately determining the actual horsepower of which a tractor is capable it would not be necessary to provide such a large reserve of power and there would be less overloading.

Further, the purchaser would not have to discount the manufacturer's rating, as he is in the habit of doing now. The proposal has been made to do away with horsepower ratings entirely, and instead to express the capacity of tractors by the number of plows they will pull. Inasmuch as the size of plow bottoms vary, and as there are great differences in the amount of power required to pull a bottom in different soils, this would be a very haphazard method.

Accuracy in Dynamometer Tests

Prof. Davidson said that two of the essentials in making a dynamometer test are accuracy and a clear record of the data obtained. A direct reading

dynamometer, he explained, was almost useless, on account of the continual and wide fluctuations of the indicator hand. The author described the Hyatt dynamometer in general terms. It had been objected, he pointed out, that a spring was not suitable for measuring drawbar pull, but it was shown that some kind of elastic material was necessary in order to register this pull. The direct indicating type of instrument being unsuitable, a recording mechanism is absolutely necessary in order to obtain reliable results.

There are advantages in having tractor tests in connection with field demonstrations. When there are a large number of tractors assembled together at one point tests can be made with the least effort. However, the hurrah and excitement which usually mark these assemblies are detrimental to the conduct of the tests.

In the discussion of the paper it was pointed out that the subject of a standard rating was one of great importance to the tractor industry. Many state agricultural colleges are studying the problem and the State Legislatures are planning legislation covering the point, with the object of protecting the farmer. Therefore, if the tractor manufacturers are not careful there may soon be as many tractor rating formulas in use as there are States in the Union.

It was pointed out by Prof. White of Illinois State University that the statement that no tractor dynamometer was manufactured suitable for making two-hour dynamometer tests was incorrect. The Burr Co. of Champaign, Ill., had been manufacturing railroad dynamometers for 15 years and had recently developed a dynamometer suitable for tractor work which had been used in plowing tests at the university. It was based on the hydrostatic principle, had a range of 1 to 10,000 lb., and was fitted with a recording mechanism. It was also brought out in the discussion that the National Vehicle and Implement Association had been considering the subject of tractor ratings.

A Standard Fuel for All Engines

The second paper was that on "The Fuel Situation," by Dr. Joseph E. Pogue of the United States Fuel Administration. Dr. Pogue covered substantially the same ground as in the paper which he read at the S. A. E. annual meeting in New York last month, but handled the subject more from the standpoint of the tractor manufacturer. He said that the present tendency in the tractor industry with respect to fuel appeared to him

unwise. At the present time the United States has an annual production of 40,000,000 bbl. of kerosene, which sells at about one-half the price per gallon of gasoline. Seventy million barrels of gasoline are produced per year. Kerosene, however, may not always be cheaper than gasoline, as with the rapid increase in the number of tractors the demand will grow quickly, while, on the other hand, owing to the development of the so-called cracking process, the amount of kerosene derived from a certain production of crude oil will become less. Gasoline, under present conditions bringing a higher price than kerosene, the tendency naturally is to convert more and more kerosene into gasoline. This will before long result in a scarcity of kerosene.

Reverting to his remark that it would be unwise to design tractor engines for kerosene fuel, Dr. Pogue said that kerosene had been specially designed to possess wick climbing properties, which were unessential in an internal combustion engine.

The Fuel Problem

The present outlook was that both automobiles and trucks must be developed to burn heavier fuel, and Dr. Pogue suggested the advisability of designing all types of automotive apparatus to use the same kind of fuel. The tractor fuel problem does not stand alone, but will have to be solved along with the fuel problems for other types of internal combustion engines. The problem really is, whether both truck and tractor engines shall be designed to consume a heavier grade of fuel, leaving the lighter constituents of petroleum for use in passenger car engines, or whether all kinds of automotive apparatus shall use the same fuel. From one point of view at least the latter course would be preferable, as it would greatly simplify the fuel distributing problem, and result in important economies.

One other point brought out by Dr. Pogue was that the price of the fuel determines the saturation point of the country with respect to both automobiles and tractors. That is to say, if there are a certain number of farmers who can afford to operate a tractor burning a fuel costing, say, 15 cents per gallon, then the number of farmers who can afford to operate a tractor designed to run on a fuel costing 50 cents per gallon is materially smaller.

In the discussion of this paper Dr. Pogue was asked about the probable influences the resources of the country in shale oil deposits would have on the fuel situation. In the reply it was brought out that shale oils are analogous to petroleum in their chemical composition, and by distillation will yield practically all of the fractions which are now obtained from crude oil. However, the cost of obtaining these fractions from shale oil is very much greater, as the latter have to be mined, crushed and then subjected to the distillation process.

(Continued on page 554)

Tractor Trials in Great Britain

Shortage of 60,000 Tractors in United Kingdom—Agencies Under Car Dealers Popular

LONDON, Jan. 28—The Society of Motor Manufacturers and Traders, Ltd., which corresponds to the National Automobile Chamber of Commerce in America, has decided to hold a trial of tractors about the end of September in the Midlands. At first there were hopes that this body as representing the motor industry would be assisted by and associated with the Royal Agricultural Society of England, the premier and oldest organization of farmers and implement makers, but the latter body favored postponing the trial to next year.

It is of interest as marking the passing of the implement and tractor trade from the older order of implement dealers to the motor dealer. The step has been in preparation since the introduction of tractor plowing and cultivation on the grand scale, which was brought about by the threatened shortage of food cereals in consequence of the war's demands on ships and the losses of food ships by submarines.

Tractors and Farm Implements

The tractor and implement trade was solely in the hands of the implement dealers; and of tractors, at least of the gasoline sort, there were but a few scores where now they number hundreds, three-fourths of them being American. The implement and farm engine makers concentrated on steam plant until about three or four years before the war, when there began to be seen fewer steam engines and more oil and gasoline engines, but hardly any except steam locomotives for land work.

The result was that such equipment was hired by those whose farm lands were large enough to make it remunerative; the vast majority of farmers having no interest in it or its development, instead of horses. It is otherwise since motor dealers began to push American tractors.

Fortunately, at the outset of this branch of motor trade enterprise, the cost of imported tractors was not prohibitive, and when it did rise in consequence of war conditions, prices of crops and other factors had turned in favor of the farmers, backed by the compulsory tillage policy of the Government acting through its Food Production Department.

It happened also that the services of motor dealers were taken advantage of in this campaign, and latterly the dissemination of hundreds of Fordson tractors both increased the hold on this industry of the motor dealers as Fordson agents (most of them being also dealers in Ford cars) and widened the farmers' interest.

Officially, it was stated last year that there were nearly twenty million acres

now in tillage in the United Kingdom. It has been computed that from 50,000 to 75,000 tractors are needed to maintain the vast bulk of British farms under 500 acres in arable condition.

At the moment there are probably not more than 10,000 tractors available in the United Kingdom, and so far there is no evidence of any real effort toward a home production of tractors. The Austin Co., at Birmingham, were recently reported to have fixed the price of their tractor at £200 (\$1,000), but, considering that the Fordson, which has been on the market for nearly two years, is listed here at £250 (\$1,250), and that the Austin has a governor and geared belt pulley, it may be doubted if the Austin or any other British tractor can be produced to sell at less than the Fordson under present market conditions in this country.

A Scottish firm has been trying out a two-cylinder tractor after the style of the older Moline. Beyond having seen the first sample on a farm land in course of testing, nothing has appeared. Prior to the big rise in transatlantic freight charges the Moline was one of the cheapest and most interesting imported tractors, hence it may be inferred that this Scottish model, if it is a success, will be priced to correspond with the Moline on the British market. The Moline appeals to British farmers, as it is light and handy, and one of the very few really single-handed tractors. The Fordson has sold here largely on price, and because of the Ford "service" associated with it, the bulk of the dealers concerned in it being also Ford car dealers.

Need of Special Tractor Implements

British farmers are not too favorable to a three-furrow tractor, and certainly they do not take kindly to the usual American 14-in. bottom with its flat turn over of the furrow. Our normal horse plow will average $\frac{1}{2}$ acre per 10-hr. day, with two horses. A two-furrow tractor, capable of averaging three acres per day, of corresponding duration, is appraised better than a more powerful machine, with a bigger output on a very much larger fuel consumption.

Many tractors here have not been improved by efforts to run them on kerosene. The International Harvester Co.'s tractors may be cited as successful on this score, but these have slow-running engines, and an adequate lay-out for water injection. The fuel drawback, however, is likely to be removed with the large increase of gasoline. In fact, at present there is more gasoline than there are engines and vehicles in which to use it.

A need found here as well as in America is a line of special implements for tractors of the sort and size referred to. The implement makers promise to supply this want, but, judging from the delay in starting on tractors themselves, the outlook is not too reassuring in that quarter.

Among implements needed is a smaller
(Continued on page 554)

Standardized Fuel Urged by Pogue

Speaking at S. A. E. Dinner—Two Kinds of Dealers and Three Types of Tractors

KANSAS CITY, MO., Feb. 27—The present policy of fuel for automotive apparatus is unwise in that the greatest possible fuel value is not being had from each gallon of crude, and something must be done to determine the future of this question, is the opinion of Joseph A. Pogue of the fuel administration, Washington, at the annual tractor dinner of the S. A. E. here to-night. Mr. Pogue, speaking especially to tractor men, sees two solutions to the fuel question.

1—The first is to use the entire range of petroleum products which will burn successfully in all types of internal combustion engines. It means one standardized fuel for all types of apparatus.

2—The second is to have two standard fuels, a light one for motor cars and airplanes and a heavier one for trucks and tractors.

Mr. Pogue favors the first plan. He wants one fuel because it will mean cheaper and easier merchandising, and it will also give more fuel value out of a gallon of crude. He argued for a greater splitting up of kerosene and thus greatly increasing the production of gasoline and reducing the quantity of kerosene.

J. B. Bartholomew, president of the Avery company, looks for two kinds of dealers, and two only. There will be the tractor dealer who sells tractors and all farm machinery to be used with them. The second class will be the hardware man, who will handle horse-drawn machinery and equipment. The division between motor equipment and horse equipment is becoming more defined every day.

Finley P. Mount, president of the Advance-Rumely Thresher Co., and toastmaster for the dinner at which 270 attended, looks for three kinds of tractors to round out the field of farm requirements—heavy, medium and light.

E. A. Johnson, engineer of the International Harvester Co., also spoke.

David Beecroft gave an illustrated talk on his trip over the devastated areas of France and Belgium.

S. A. E. to Visit Splitdorf

NEW YORK, March 5—The Splitdorf Electrical Co. has invited the Metropolitan Section of the S. A. E. to make an inspection trip through its plant in Newark on March 7. The company will have automobiles meet the party at the station and will entertain them at luncheon. It has requested that the number be limited to 150.

New Comet 1½-Ton Truck

DECATUR, March 1—The Comet Automobile Co. is now producing a 1½-ton truck to sell for \$1,750 in place of the 1¼-ton model which sold for \$1,575.

January Exports Satisfactory

New Year Augurs Well for Our Foreign Trade in Automotive Products

	Cars	Value	Trucks	Value	Parts
Jan. 1918	2,137	\$2,916,381	907	\$2,375,584	\$2,406,783
Dec. 1918	1,703	2,203,027	896	2,636,689	2,191,511

1918

Jan. 1919	4,325	3,841,871	1,156	3,328,870	2,665,278
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WASHINGTON, March 5—Although it may not be apparent at a casual glance why our export figures are tabulated for the seemingly odd number of seven months in the tables herewith there is a reason. This reason is that the seven months in question bring the data to the commencement of the new fiscal year, commencing on July 1. As on this basis the figures coincide with the commercial year of a number of concerns engaged in the automotive industry, it is suggested that they may be peculiarly applicable for purposes of comparison.

January exports from the various ports of the United States are exceedingly satisfactory. There is an appreciable (though possibly not a really substantial) increase in cars, trucks and parts, and that this is the case argues well for our increased merchant marine. After all, the matter of available shipping when and where it is needed is of primary importance if we are to maintain our position in the world's markets.

So far it has not been a matter of lack of orders, it has been simply a question of ships to transport the goods.

It is true that at the present time many ships which will be available for commercial expansion at a later date are engaged in the work of repatriating our men from overseas. Once this shipping is released (and the time does not seem far distant) there is every reason that the present automotive export figures will be increased appreciably.

It is, however, equally correct to state that much of our export trade has been simply handed to us. For some time we have had no competitors in the markets of the world. Conditions are altering rapidly, and it is up to us to retain, and improve, our position in those markets.

Weekes-Hoffman to Make Gears

SYRACUSE, N. Y., March 4—The Weekes-Hoffman Co. has completed plans to enter the gear manufacturing industry, and will shortly be turning out gears for automobiles and tractors in quantities which will necessitate the employment of 250 men in the plant on Dickerson Street. W. H. Diefendorf has severed his connection as chief engineer and a director of the New Process Gear Corp. to join the Weekes-Hoffman Co. as vice-president and general manager. J. M. Weekes is president, and A. J. Hoffman secretary and treasurer.

Air Service Club of America Formed

NEW YORK, March 4—The Air Service Club of America has been organized by army fliers to promote the social interests of aviators.

January Exports from New York

New Year Brings Big Increase in Cars, Trucks and Parts Value

NEW YORK, March 5—Exports of automotive products from this port have fluctuated throughout the past year, not so much on account of the variation in the volume of orders as on account of the limitations of shipping facilities. The real position has been that each month would have fully maintained its average but for restrictions brought about by lack of ships.

Latin American Trade Satisfactory

The new year starts well with increased exports in cars, trucks and parts. In January cars numbered 1047 as against 740 in December, 1918, the respective values being \$1,480,832 and \$1,020,126. Trucks numbered 515 in January, as compared with 430 during the previous month, and their value advanced from \$1,564,293 to \$1,604,418. Similarly, the value of parts was \$1,189,577, as compared with \$898,513 in December.

Latin American trade continues satisfactory, Argentina being our principal customer for passenger cars, but Australia and British South Africa were our largest buyers. Japan's purchases of trucks were surprisingly large and augur well for trade development.

Exports of Automotive Equipment for January and Six Previous Months

	Month of January				Seven Months Ending January, 1919.			
	1919		1918		1919		1918	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	41	\$562,600	13	\$161,465	41	\$562,600	13	\$161,465
Airplane parts	.....	9,217,112	.....	4,106,595	.....	9,217,112	.....	4,106,595
Commercial cars	6,308	17,012,820	8,317	22,635,150	6,308	17,012,820	8,317	22,635,150
Motorcycles	4,241	1,018,766	6,271	1,330,059	4,241	1,018,766	6,271	1,330,059
Passenger cars	16,482	18,614,487	34,080	28,702,545	16,482	18,614,487	34,080	28,702,545
Parts, not including engines and tires	.....	19,751,407	.....	19,335,816	.....	19,751,407	.....	19,335,816
Total	.....	\$55,378,714	.....	\$70,673,816	.....	\$55,378,714	.....	\$70,673,816
ENGINES								
Automobile, gas	15,203	\$2,367,577	22,846	\$2,610,508	15,203	\$2,367,577	22,846	\$2,610,508
Marine, gas	3,313	1,785,801	4,921	1,486,875	3,313	1,785,801	4,921	1,486,875
Stationary, gas	13,555	1,907,499	14,413	1,598,254	13,555	1,907,499	14,413	1,598,254
Tractor, gas	12,323	14,024,784	10,483	11,035,483	12,323	14,024,784	10,483	11,035,483
Total value	.....	\$20,085,661	.....	\$16,731,120	.....	\$20,085,661	.....	\$16,731,120

EXPORTS BY COUNTRIES JANUARY, 1919

	Passenger Cars		Trucks	
	No.	Value	No.	Value
Argentina	232	\$247,388	28	\$60,800
Australia	308	282,653	.....	.....
British India	1	985	.....	.....
British South Africa	129	144,614	.....	.....
Canada	.....	.....	64	98,215
Chile	73	139,064	.....	.....
Cuba	91	197,856	82	154,016
Denmark	11	28,839	.....	.....
Dutch East Indies	79	116,632	244	1,224,830
France	28	128,619	.....	.....
Mexico	163	217,934	.....	.....
New Zealand	72	79,333	.....	.....
Norway	.....	.....	.....	.....
Philippine Islands	156	211,147	.....	.....
Russia in Asia	.....	.....	.....	.....
Russia in Europe	.....	.....	.....	.....
Spain	9	11,976	.....	.....
United Kingdom	.....	.....	17	34,176
Uruguay	44	108,673	.....	.....
Other Countries	658	911,002	472	803,547
Totals	2,137	\$2,916,381	907	\$2,375,584

SEVEN MONTHS ENDING JANUARY, 1919

	Passenger Cars		Trucks	
	No.	Value	No.	Value
Argentina	791	\$956,241	31	\$64,894
Australia	1,890	1,774,952	.....	.....
British India	28	43,741	.....	.....
British South Africa	670	675,565	.....	.....
Canada	.....	.....	959	1,291,048
Chile	746	1,149,028	.....	.....
Cuba	962	1,493,341	361	693,086
Denmark	107	184,255	.....	.....
Dutch East Indies	1,157	1,476,443	.....	.....
France	523	439,763	2,269	9,236,165
Mexico	993	1,011,548	.....	.....
New Zealand	711	687,140	.....	.....
Norway	187	398,266	.....	.....
Philippine Islands	759	827,584	.....	.....
Russia in Asia	3	11,734	15	18,200
Russia in Europe	6	6,605	.....	.....
Spain	468	622,820	.....	.....
United Kingdom	.....	.....	849	2,495,445
Uruguay	462	415,894	.....	.....
Other Countries	4,283	4,733,423	1,824	3,213,982
Totals	16,482	\$18,614,487	6,308	\$17,012,820

Refinance Saxon Company; Pick Prominent Head

DETROIT, Feb. 27—It was stated today by officials of the Saxon Motor Car Corp. that Chicago, Boston and New York bankers have agreed to refinance the company to the extent of \$5,000,000, and that the Saxon would start operations within 60 days. Reorganization details were completed at a meeting in Chicago Wednesday, Feb. 26. The new organization will be effected within the next 10 days. Financial men backing the project assume all Saxon liabilities, and the company will start again with a clean slate. Details of the refinancing plan cannot be announced at this time, but it is said the banking interests involved are among the largest in the country and are amply able to put the project across.

The Saxon officials deny the rumor published in New York and Boston financial dailies telling of a proposed merger with the Doble-Detroit Steam Car Corp. There will be no enlargement of the present Saxon plant this year. The present manufacturing policy will be continued, and standard Saxon models embodying many refinements will be produced.

Characteristics of Standardized Engine (Continued from page 527)

An additional advantage is the fact that a valve equipped with two springs will still function, even with one spring broken or out of commission.

Force-feed lubrication is of course essential to insure a proper and efficient lubrication. A high pressure up to 80 or 90 lb. per square inch is recommended for speeds up to 3800 r.p.m. A series of gear pumps or a multiple-plunger type pump may be used. Oil leads should be of generous size, and provision for effective cooling of the oil should be made before returning it through the engine circulating system. The above oil pressure of from 80 to 90 lb. per square inch may seem unnecessarily high, but it is advisable, because the function of the oil in the bearings is not only to reduce friction to a minimum but also to disperse the heat. For that reason very large aluminum bearing caps may be used, although ordinarily a light steel forging is to be preferred.

In such a standardized engine most parts, such as cylinders, pistons, valves, connecting-rods, may be made interchangeable, thereby effecting a considerable saving in manufacture. Special bracket or hanger adapters will make the engine installation suitable to several makes of chassis.

K. C. Show Mecca for Parts

(Continued from page 544)

retail sales obtained which are being handed over to the dealers.

The attendance was much ahead of last year; in fact, it was beyond expectations. There were several thousand dealers and the farmers filled the place from early morning until supper time. There was little doing at night.

Every exhibitor is pleased and plans for next year are for a bigger show. The \$40,000 building used this year is already being torn down. One thing is certain: Kansas City has had the national tractor show for 4 years and is not going to let it slip away. Minneapolis is being watched with anxious eye, but there is room for two or three.

It is more or less of a mistake not to have several larger territorial tractor shows. They could not all be national shows but they would be most valuable to dealers and farmers.

Vahan Products Enters Cleveland

CLEVELAND, March 1—The Vahan Products Co., a new corporation, has purchased from the Western Machine Products Co. its property on the northwest corner of East Seventy-third Street and St. Clair Avenue N. W. The land, building and equipment will cost more than \$350,000, and the new company will employ at the start from 300 to 400 men. Automatic screw machine products will be manufactured. The Western Machine Products Co. during the war, manufactured airplane parts for Rolls-Royce. S. S. Shields is president of the Vahan Products Co.; L. H. Mesker, vice-president; A. W. Leuke, treasurer, and L. M. Lucius, secretary. Operations in the new plant will commence at once.

American Plane Establishes New Record for Speed

WASHINGTON, March 1—New records for speed and climbing were established yesterday by an American designed and built airplane, according to announcement by the War Department of the results of preliminary tests of a machine constructed at Ithaca, N. Y.

In the tests the plane attained an officially timed speed of 163 2-3 m.p.h., or 2.72 miles per minute, and climbed 10,000 ft. in 4 min. 52 sec. The best previous climbing performance was 10,000 ft. in a little more than 6 minutes.

The new plane, except for diminished wing span, was described as not widely different from the common type of single-seated biplane. The wings measure only 26 ft., or 6 ft. less than the small Spad machine. The motive power is a 300 hp. Hispano-Suiza engine. The machine, full loaded, weighs 2050 lb. and has a full speed operating period of three hours.

The quickest trip between Washington and New York in a mail plane with a 150 hp. engine was also made yesterday when Aviator Biffle took mail from College Park to Belmont Park, a distance of 218 miles, in 2 hrs. 2 min., flying time. The speed between Washington and Philadelphia was 97 1/2 m.p.h. and between Philadelphia and New York 125 1/2 m.p.h.

AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR JANUARY

	Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Argentina	192	\$212,286	28	\$60,800	\$345,846
Australia	225	187,866	3	10,200	78,469
Barbadoes	1	1,800	1	3,000	1,785
Bolivia .....	..	..	..	..	5,592
Brazil	48	70,659	..	..	46,019
British East Africa	19	15,415	..	..	4,038
British East Indies .....	..	..	3	4,000	3,185
British Guiana	2	2,250	..	..	6,587
British India	1	985	..	..	31,890
British Oceania .....	..	..	..	..	50
British South Africa	105	121,333	23	29,886	79,462
British West Africa	1	1,075	..	..	2,872
British West Indies	1	936	..	..	14,122
Chile	73	139,064	1	3,282	42,179
China	16	20,148	..	..	7,942
Colombia	17	29,068	..	..	9,757
Cuba	34	84,109	24	57,061	143,178
Danish West Indies .....	..	..	..	..	3,697
Denmark	11	28,839	..	..	130
Dutch East Indies	10	13,827	6	20,154	12,401
Dutch Guiana .....	..	..	..	..	1,125
Dutch West Indies .....	..	..	..	..	184
Ecuador	2	2,925	..	..	1,214
England	5	5,795	17	34,176	127,636
France	22	117,700	211	1,047,980	1,176
French Africa .....	..	..	..	..	170
French Guiana .....	..	..	..	..	77
French West Indies	2	2,250	2	1,233	14,440
Greece	6	8,806	1	700	19,310
Haiti	22	18,558	..	..	4,314
Honduras .....	..	..	..	..	32
Hongkong .....	..	..	..	..	2,055
Iceland .....	..	..	..	..	584
Italy .....	..	..	..	..	33,822
Jamaica	3	5,400	..	..	4,983
Japan	57	73,789	163	269,750	6,620
Liberia .....	..	..	6	12,581	13
Mexico	14	24,770	..	..	6,217
Newfoundland	1	893	..	..	184
New Zealand	24	29,852	2	5,966	4,354
Nicaragua .....	..	..	7	15,800	1,175
Norway .....	..	..	1	1,480	10,477
Panama	2	950	..	..	2,294
Peru	30	57,158	..	..	15,871
Philippine Islands	6	4,480	5	13,719	24,437
Portugal	11	20,977	1	2,044	4,672
Salvador	1	1,500	..	..	587
Santo Domingo	10	15,098	1	2,523	1,468
Scotland .....	..	..	..	..	2,355
Spain	8	10,976	..	..	2,844
Straits Settlements .....	..	..	8	5,533	879
Trinidad	1	1,276	..	..	4,677
Uruguay	44	108,673	1	2,600	45,969
Venezuela	20	34,396	..	..	4,181
Totals	1,047	\$1,480,832	515	\$1,604,418	\$1,189,577

New Twin City Tractor of Backbone Type

MINNEAPOLIS, March 3—A new tractor, known as the Twin City 12-20, has just been brought out by the Minneapolis Steel & Machinery Co. The engine is of the 16-valve type, all valves being located in the cylinder heads. Samples of the machine have been in the hands of farmers for some time, but its public announcement was reserved for the New York and Kansas City shows.

It is claimed for the double valve construction that it permits the cylinders of clearing themselves better of burnt gases, thus insuring a higher volumetric efficiency and increased power. The new tractor is designed to operate on kerosene, on which fuel its engine is claimed to develop 35 hp., while on gasoline it develops 40 hp. at 1000 r.p.m.

Other features include a pressure feed lubrication system, water circulation controlled by a thermostatic valve, a sealed and enclosed governor and a backbone type of frame. A full technical description of this machine will be published in an early issue of AUTOMOTIVE INDUSTRIES.

Sperry Wants Enemy Gyroscope Patents

WASHINGTON, March 1—The Sperry Gyroscope Co., Brooklyn, has asked the Federal Trade Commission for licenses to use nine alleged enemy patents covering the manufacture of gyroscopic apparatus. The commission is considering the application.

Gramm-Bernstein Trucks to Be Sold Direct

LIMA, OHIO, March 1—The Gramm-Bernstein Motor Truck Co., which until recently sold its truck in the Eastern territory through the Gramm-Bernstein Sales Corp., with offices in New York, Philadelphia and Akron, will direct sales and service hereafter from the factory.

Hudson Peace Schedule

DETROIT, March 1—The Hudson Motor Car Co. will devote the entire plant erected for the manufacture of shells during the war to the production of its new Essex. It is estimated that it will make 20,000 Essex cars this year. The same number of Hudson Super-Sixes will be turned out and by June it is estimated that the monthly output of Super-Sixes will be about 2000. At a recent meeting of the Board of Directors the expenditure of \$1,000,000 was authorized for additional machinery and manufacturing facilities.

Reo Shipping 74 Cars Daily

LANSING, March 5—The Reo Motor Car Co. is making a number of shop changes and otherwise getting back into peace production. Although not completely adjusted as yet to domestic business, the company is shipping an average of 74 vehicles a day.

Current News of Factories*Notes of New Plants—Old Ones Enlarged***Hawkins Denies Merger Rumors**

DETROIT, Feb. 27—Norval A. Hawkins, former sales manager of the Ford Motor Co., denies all rumors of a proposed truck and tractor combine which he is said to be forming.

Republic Purchase Story Unfounded

DETROIT, Feb. 27—W. C. Durant, president of General Motors Corp., which is said to have recently purchased the Republic Motor Truck Co., Alma, positively denies that such a deal has taken place.

To Make English Dunlop Tires in Canada

TORONTO, March 3—The Dunlop Tire & Rubber Goods Co. has obtained rights to the tire-making methods and formulae of the English company and will have access to the large rubber plantations owned by the parent concern in England.

First Wolverine Tractor Completed

SAGINAW, MICH., March 1—The Wolverine Tractor Co., newly organized, has built its first tractor, and within 30 days quantity production will start. One thousand machines will be built during 1919. Within 60 days 75 men will be working in the plant, which will occupy about half of the old Bransfield-Billings factory. W. E. Wood, Detroit, is president of the new concern, and W. H. Wagenhals superintendent.

Champion Ignition Co. to Produce 120,000 Plugs Daily

FLINT, March 1—The Champion Ignition Co. is now producing 80,000 plugs a day, but will run this production up to the 100,000 mark in March, and 120,000 daily by early summer. During the war the company was busy on plugs for the Liberty and other aircraft engines, producing 40,000 daily for the Government.

1000 Trenam Tractors Planned for 1919

STEVENS POINT, March 4—The Trenam Tractor Co. at its annual meeting made provision for the beginning of quantity production of the Trenam tractor. It is hoped to manufacture more than 1000 during 1919. Since establishing its plant, the Trenam company has devoted much of its capacity to the production of castings for other companies, at the same time developing its tractor design, which now is ready for the market. J. J. Trenam of Milwaukee, who designed the tractor, was re-elected president and general manager of the company.

Six-Cylinder Maibohm Half-Ton Business Car

RACINE, March 4—A business car with a capacity of ½-ton, selling for \$1,290, is being delivered to dealers by the Maibohm Motors Co. It is powered with a six-cylinder Falls engine with cylinders 3½ x 4¼ in. The valves, which are in the head, are adjustable, and the cooling is by thermo-syphon system, using a Perfex radiator. Starting and lighting is by a Wagner 6-volt, two-unit system with a Bendix drive starter and generator driven through helical gears in the gearcase. The Willard battery is carried in a steel cradle under the floor boards. The car is assembled of standard parts, including such units as Borg & Beck clutch, Mechanics Machine selective sliding gearset, Brown-Lipe-Chapin differential, Jacox steering gear and Thermoid brakes. The gearset and clutch form a unit with the engine and the control levers are overhung from the gearset case within easy reach of the natural driving position. The drive is Hotchkiss with two 4-in. universal joints and a seamless tubing propeller shaft. Springs are semi-elliptic, wheels artillery type, and the tire equipment consists of 32 x 3½ in. pneumatics with non-skid in the rear. The wheelbase is 116 in., weight 2420 lb., loading space 6 ft. long, 4 ft. high and 3½ ft. wide.

Saxon Offices in London and Paris

DETROIT, March 1—The Saxon Motor Car Corp. is about to open export offices in London and Paris. The Paris office will be in charge of M. Eller and the London office under the supervision of D. Eller, both of New York. They sail for Europe next week.

Aument & Gillespie, Consulting Engineers

NEW YORK, March 4—Carroll M. Aument, formerly an engineer of the Wright-Martin Aircraft Corp., has resigned his position and opened a consulting, designing and sales engineering office at 87 Nassau Street under the name of Aument & Gillespie.

Wilson Body Co. to Deliver 63,000 Bodies

DETROIT, March 3—The C. R. Wilson Body Co.'s business for January exceeds \$600,000. Orders already on the books call for the 1919 delivery of 63,000 bodies. The company is making bodies for the Ford Motor Car Co., Paige-Detroit Motor Car Co., Hupp Motor Car Corp., Liberty Motor Car Co., Oakland Motor Car Co., Reo Motor Car Co., Saxon Motor Car Corp. and Willys-Overland Co.

Packard Back in Passenger Production

DETROIT, March 5—The Packard Motor Car Co. has completed its shift from 100 per cent war production back to commercial work. It has resumed the manufacture of passenger cars, the first of which will be ready in May. Commercial truck manufacture has been under way for some time.

Nash Net Profits \$1,473,638 for 1918

KENOSHA, WIS., March 3—Net profits of the Nash Motors Co. for the year ended Dec. 1, 1918, after all necessary deductions were made, amounted to \$1,473,638, which is \$554,146 less than the \$2,027,784 earned from Aug. 31, 1916, to Dec. 1, 1917. The surplus of \$2,503,831 was \$87,697 more than \$2,416,134 in 1917.

The balance sheet of Nash Motors Co. as of Dec. 1, 1918, compares as follows:

Assets		
	1918	1917
Property less depreciation	\$2,911,633	\$3,261,175
Miscellaneous investments	103,941	117,241
Liberty bonds	800,000	.....
Accounts receivable	3,226,364	2,120,735
Inventories	4,889,102	4,607,830
Prepaid expenses	5,316	4,275
Total	\$11,936,385	\$10,111,256

Liabilities		
	1918	1917
Preferred stock	\$5,000,000	\$5,000,000
Common stock	50,000	50,000
Accounts payable	1,788,674	1,311,126
Accrued taxes	764,141	355,109
*Reserves	1,829,739	978,887
Surplus	2,503,831	2,416,134
Total	\$11,936,385	\$10,111,256

*These reserves do not cover Federal taxes which have been provided for by deduction from cash and receivables as above shown.

Commerce Declares Dividend

Commerce Motor Car Co., Detroit, 1½ per cent on capital stock, payable to stockholders of record on April 1; 1 per cent, extra dividend, payable to stockholders of record April 1.

Pennsylvania Rubber Declares Dividends

The Pennsylvania Rubber Co., Jeanette, Pa., quarterly dividend 1¼ per cent preferred, 1½ per cent common.

Republic Truck Dividend

The Republic Motor Truck Co., Inc., Alma, \$1 a share on its common stock, paid Feb. 15 to all stockholders of record Jan. 31.

Hebb Dividends

Hebb Motors Co., Lincoln, Neb., 7 per cent quarterly, preferred; 10 per cent, common. The capital of the company has recently been increased from \$1,250,000 to \$2,500,000.

Chandler Declares Dividend

The Chandler Motor Car Co., Cleveland, has declared a quarterly dividend of \$3, payable April 1, to stockholders of record March 11.

Swinehart Declares Extra Dividend

AKRON, March 5—Directors of the Swinehart Tire & Rubber Co. have authorized the payment of a dividend of 2 per cent in cash on April 15 to stockholders of record March 31, also an extra 10 per cent in preferred stock on March

5 to stockholders of record Feb. 20. These are the first dividends on common stock of this company authorized since Oct. 15, 1917.

Sales in 1918 amounted to \$3,910,000, an increase of 100 per cent over those of 1917. Net earnings, it is said, amounted to \$500,000. There is \$800,000 common stock outstanding. The only change in officials was the addition of C. C. Lee of the Union Commerce National Bank, Cleveland, as director.

Emerson-Brantingham \$2,071,604 Surplus in 1918

ROCKFORD, ILL., March 3—A surplus of \$2,071,604 is reported in the balance sheet of the Emerson-Brantingham Implement Co. of Oct. 31, 1918. This amount is \$1,069,284 more than the \$1,002,320 earned in 1917.

The competitive balance sheet for the last three years follows:

Assets			
	1918	1917	1916
Real estate, buildings, machinery, etc.	\$7,295,865	\$6,928,961	\$6,814,661
Patents and good will ..	4,614,402	4,614,403	4,614,403
Preferred stock	388,065	147,198	.....
Inventories ..	12,258,672	8,566,498	6,552,165
Accounts receivable ..	4,439,242	6,135,592	7,398,435
Sundry debtors ..	292,543	199,984	112,711
Cash	837,301	627,852	504,501
Liberty bonds ..	326,468	.....	.....
Miscellaneous ..	56,788	110,028	170,752
Prepaid expenses ..	114,770	112,490	120,462
Total	\$30,623,110	\$27,443,006	\$26,288,091

Liabilities			
	1918	1917	1916
Common stock	\$10,132,500	\$10,132,500	\$10,132,500
Preferred stock	12,170,500	12,170,500	12,170,500
Notes payable ..	4,446,516	2,692,959	3,098,061
Accounts payable* ..	957,012	950,865	344,793
Reserve for contingent losses	631,992	493,862	464,153
Surplus	2,071,604	1,002,320	78,084
Total	\$30,623,110	\$27,443,006	\$26,288,091

*Including Federal taxes accrued.

Stromberg Extra Dividend

The Stromberg Motor Devices Co., Chicago, has declared an extra dividend of 25 cents a share in addition to the regular quarterly dividend of 75 cents a share, payable April 1, to stockholders of record March 15.

Wisconsin Motors Stock Issues

MILWAUKEE, March 1—The Wisconsin Motor Mfg. Co. is marketing an issue of \$800,000 of 8 per cent cumulative preferred stock at par. In addition, the company has \$1,000,000 of common stock, valued at \$1,500,000 at market value. Its net sales for 1918 exceeded \$5,700,000.

Hilo Varnish to Share Profits

BROOKLYN, March 3—The Hilo Varnish Corp. has decided to distribute half the profits of the company annually among its employees, giving each a share proportionate to his salary and the length of time he has been in its service.

Fisk Sales \$6,765,482 Ahead of 1917

CHICOPEE FALLS, MASS., March 4—Net sales of \$36,682,163 are reported in the financial report of the Fisk Rubber Co. for the year ended Dec. 31 last, which is \$6,765,482 more than the \$29,916,681 in 1917. Net profits for the year are \$3,760,279 after deducting manufacturing cost, depreciation, interest, etc. Federal taxes paid in 1917 amounted to \$549,913, and in 1918 the estimated provision for Federal and excess profits taxes was \$1,253,426.

The balance sheet, dated Dec. 31, 1918, compares as follows with the reports of the two previous years:

Assets			
	1918	1917	1916
Real estate, buildings, machinery, etc.	\$7,780,649	\$7,146,447	\$5,876,308
Good will and patents ..	8,000,000	8,000,000	8,000,000
Investments ..	334,599	284,623	404,342
Inventories ..	14,909,531	17,737,638	7,476,204
Tires in use under mileage contracts	67,479	68,561	38,202
Due on notes from employees for stock subscriptions ..	429,927	462,717	99,835
Accounts receivable ..	4,915,453	6,262,541	5,274,296
Cash	1,976,098	1,658,894	367,088
Deferred charges ..	315,038	365,348	260,479
Total	\$38,728,778	\$41,986,769	\$27,796,754

Liabilities			
	1918	1917	1916
Capital stock ..	\$21,129,900	\$21,525,000	\$21,900,000
Loans and accounts payable	9,731,123	14,684,683	2,832,294
Accrued wages	11,061	24,010	37,764
Unpaid dividends ..	.....	6,706	4,485
Reserves	238,801	360,648	171,768
Surplus appropriated for retirement of preferred stock ..	1,938,542	1,380,329	975,000
Surplus	4,425,923	4,005,393	1,875,443
Total	\$38,728,778	\$41,986,769	\$27,796,754

Allis-Chalmers Sales \$35,031,233 for Year

MILWAUKEE, March 5—Gross sales of \$35,031,233 are reported in the financial report of the Allis-Chalmers Mfg. Co. for the year ended Dec. 31, 1918, an increase of \$8,901,916 over \$26,129,317 in 1917. Profits, before taxes were deducted, amounted to \$9,754,748 compared with \$5,308,790 in 1917. Manufacturing costs in 1918 were reduced to 66.6 per cent of the gross business handled, as against 73.27 per cent in 1917 and 75.61 per cent in 1916. The total surplus as of Jan. 1, 1919, after all necessary deductions were made, was \$8,439,470.

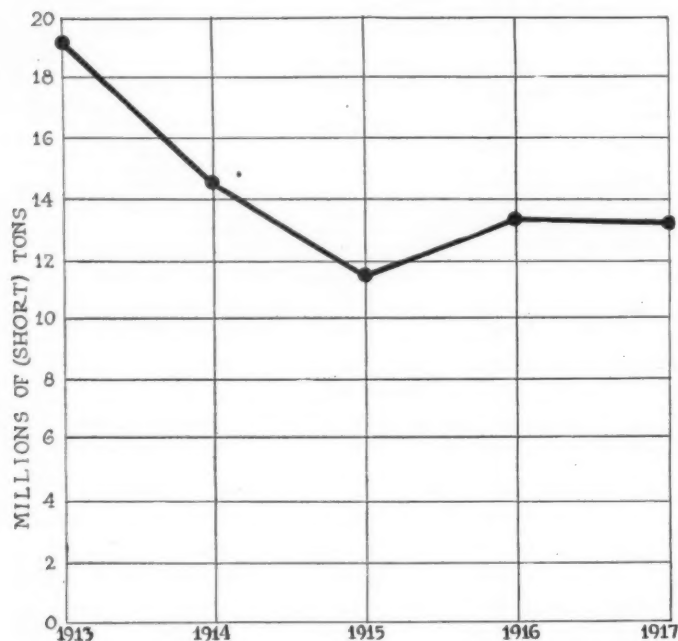
Universal Mfg. Co. in Bankruptcy

MILWAUKEE, March 1—The Universal Mfg. Co., 491 Broadway, manufacturer and dealer in farm lighting plants, electrical devices and specialties, has filed a petition in bankruptcy, scheduling liabilities at \$23,820 and assets at \$21,912. Julius J. Goetz has been elected trustee. Creditors will meet March 13 at 10 a. m. in the office of Referee John F. Harper, Federal Building, Milwaukee.

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:			Fabric, Tire (17½ oz):		
Muriatic, lb. ....	.02	-.03	Sea Is., combed, sq. yd.	1.50	
Phosphoric (85%)..	.35	-.39	Egypt, combed, sq. yd.	1.25	
Sulphuric (60%), lb.	.008		Egypt, carded, sq. yd.	1.15	
Aluminum:			Peelers, combed, sq. yd.	1.10	
Ingot, lb. ....	.30	-.33	Peelers, carded, sq. yd.	1.00	
Sheets (18 gage or			Fibre (½ in. sheet		
more), lb. ....	.42		base), lb. ....	.50	
Antimony, lb. ....	.07½	-.07½	Graphite:		
Burlap:			Ceylon, lb. ....	.09	-.22
8 oz., yd.....	.07½		Madagascar, lb. ...	.10	-.15
10½ oz., yd.....	.10½	-.11	Mexico, lb. ....	.03½	
Copper:			Lard:		
Elec., lb. ....	.15½	-.16	Prime City, gal..	1.90-2.00	
Lake, lb. ....	.18		Ex. No. 1, gal...	1.10	



Germany's output of pig iron during wartime. Such 1918 figures as are available indicate a further drop in production.

Linseed, gal.	1.45-1.48	Smoked, ribbed sheets, lb. ....	.56
Petroleum (crude):		Para:	
Kansas, bbl.	2.25	Up River, fine, lb.	.58½
Pennsylv'a, bbl.	4.00	Up River, coarse, lb.	.35
Manhaden (dark), gal.	1.05-1.06	Island, fine, lb. ....	.49½
Lead, lb. ....	.04½-.05½	Shellac (orange), lb.	.60 - .64
Leather:		Spelter ....	.06½-.06¾
Hides, lb. ....	.18 - .34½	Steel:	
Nickel, lb. ....	.40	Angle beams and channels, lb. ....	.03
Oil:		Automobile sheet (see sp. table.)	
Gasoline:		Cold rolled, lb.....	.0625
Auto, gal. ....	.24½	Hot rolled, lb.....	.039
68 to 70 gal.....	.30½	Tin .....	.71 - .72
Rubber:		Tungsten, lb.	1.50-2.10
Ceylon:		Waste (cotton), lb. ..	.12¾-.17
First latex pale crepe, lb. ....	.56 - .56½		
Brown crepe, thin, clear, lb. ....	.49		

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Blank Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

Automotive Securities on the Chicago Exchange at Close March 1

	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Auto Body Company.....	6½	8½	..	Motors Products Corp.....	40	..	..	Ajax Rubber Co.....	79½	80½	+8½
Briscoe Motor Car com....	10	..	..	Nash Motors Co. com.....	175	200	..	Firestone T. & R. com....	140	145	..
Briscoe Motor Car pfd....	40	60	+5	Nash Motors Co. pfd.....	93	97	..	Firestone T. & R. pfd....	99	101	+3½
Chandler Motor Car.....	122	124	+8	National Motor Co.....	6	10	+2	Fisk Rubber Co. com.....	95	97	+8
Chevrolet Motor Car.....	164	166	..	Packard Motor Car com....	114	113	+2	Fisk Rubber Co. 1st pfd..	100	105	-2
Cole Motor Car Co.....	90	105	..	Packard Motor Car pfd....	100	102	+1	Fisk Rubber 2nd pfd.....	97	100	..
Continental Motors com....	7½	8½	+¼	Paige-Detroit Motor com..	28¼	30	+3¾	Fisk Rubber 1st pfd. conv.	99	101	..
Continental Motors pfd....	97	..	+1	Peerless Motor pfd.....	18	21	..	Goodrich, B. F., com....	70	70½	+10½
Edmunds & Jones com....	15	20	..	Pierce-Arrow M. Car com..	44½	45½	+4	Goodrich, B. F., pfd....	10	106½	+1½
Edmunds & Jones pfd....	75	90	..	Pierce-Arrow M. Car pfd..	104	106	+2	Goodyear T. & R. com....	243	248	-2
Electric Storage Bat.....	56	62	+2	Premier Motor Corp. com..	5	..	..	Goodyear T. & R. 1st pfd..	105	107	+1½
Federal Motor Truck.....	32	36	+2	Premier Motor Corp. pfd..	..	75	..	Goodyear T. & R. 2nd pfd..	105	107	+1½
Fisher Body Co. com.....	50	55	+9¾	Prudden Wheel Company..	17¼	..	+1½	Kelly Springfield com....	111	112	+28½
Fisher Body Co. pfd.....	92	94	+2	Reo Motor Car Co.....	22¾	23¾	+1½	Kelly Springfield pfd....	90	96	-3
Ford Motor of Canada.....	315	325	+51	*Republic M. Truck com..	35½	37½	..	Lee Tire & Rubber Co....	26¾	27	+3
General Motors com.....	149	150	+19	Republic M. Truck pfd....	88	91	+1	Marathon Tire & Rubber..	55	75	..
General Motors pfd.....	84¾	86¾	+1½	Saxon Motor Car com....	10	12	+1¾	Miller Rubber Co. com....	172	175	-6
Hupp Motor Car com.....	6¾	7¼	+¾	Scripps-Booth Corp.	21	25	..	Miller Rubber Co. pfd....	102	105	..
Kelsey Wheel Co. com....	36	36½	+16	*Stewart Warner Spd. Corp	89	91	+6	Rubber Products Co.....	120	122	+3
Kelsey Wheel Co. pfd....	94	95	+3	Stromberg Carburetor Co.	40¼	40½	+¼	Portage Rubber Co. com..	160	165	-2
Manhattan Electric S. com.	..	48	..	Studebaker Corp. com....	59¼	60¼	+7	Swinehart T. & R. Co....	..	92	..
Maxwell Motor com.....	34½	35½	+3¾	Studebaker Corp. pfd....	90	94	-2	U. S. Rubber Co. com....	82½	83½	+7
Maxwell Motor 1st pfd....	59	60	+4½	Stutz Motor Car Co.....	45¾	46¾	+3¼	*U. S. Rubber Co. pfd....	111½	112½	+2½
Maxwell Motor 2nd pfd....	25	26	+3½	United Motors Corp.....	41¼	43¼	+2¾				
McCord Mfg. com.....	32	35	..	White Motor Co.....	53¾	54¾	+2½				
McCord Mfg. pfd.....	93	96	..	*Willvs-Overland com....	26¾	27¾	+1½				
Mitchell Motor Co.....	30	..	+6	Willvs-Overland pfd.....	90	91½	+2				

*Ex. Dividend.

Urgent Road Building Program

(Continued from page 544)

ably expected. Soldiers needed for farm work.

Illinois—About 40,000 are idle, of which 4000 are women. About 5000 men to be given work on State roads to cost \$60,000,000 and 3000 to work on State buildings. No feeling of pessimism nor any undue optimism.

Indiana—Situation is far more alarming. About \$42,000,000 available to be spent in public works. Private capital is holding back in building because of high labor and materials costs. About 50,000 soldiers have returned and been given places, many employers carrying extra men on the pay roll.

Kansas—Ready to use more men today. Will have \$200,000,000 wheat crop and must have much labor in Spring and Summer. Situation very satisfactory and no reason to think that all soldiers will not be employed when they return.

Kentucky—Situation is good, except in some coal districts. Many opportunities for work on farms.

West Virginia—Less than half of 80,000 miners are working full time. Great efforts must be made if men are to be given a livelihood.

Louisiana—Labor conditions fairly satisfactory. There is a shortage rather than an oversupply of labor. Not a soldier has returned who has not taken his old job or a new one. As trade of country expands great opportunities for work will open up.

Maryland—Up to this time no labor shortage. About 13,000 soldiers have been given jobs.

Maine—Greatest trouble found in getting soldiers to come back to jobs that await them. Employers expect to face a sharp labor shortage in a year.

Michigan—Condition of copper market has hit many mines. On the whole, however, the situation appears to be good, certainly it is not serious. The State is in a good position to take care of all her soldiers. Detroit has more men idle than in normal times, due to cutting off of war work.

Minnesota—No labor troubles have come

up and no great unemployment problem seems imminent. Of the 12,000 soldiers who have returned, 4674 have taken their old jobs, and of the remainder all except about 800 have been placed in new jobs. The boys from the farms show a tendency to stop in the cities and enter industrial life. Building operations in Spring may prove disappointing.

Several mayors objecting to the reports made by the governors, and especially those city executives from the far western states where there has been considerable trouble claimed that the state executives were not closely in touch with the conditions and did not know how serious the labor surplus is.

Governor Edge of New Jersey recommended that the Federal Government should release industry from Government restraint at once, and Governor Cox of Ohio combatting this view stated that the Federal powers should continue to interest themselves in industry. He said that the country was being asked at present to listen to two groups of extremists, one wanting prosperity held up in order to "teach labor an object lesson" and the other anxious to proceed with projects regardless of costs.

He urged road building as a buffer employment measure and suggested the creation of an organization in Washington to find out for the Federal Government what should be a fair price for gravel, crushed stone and other road building material, declaring that artificial prices fixed by unpa-triotic men were holding up road construction.

Roger W. Babson, representing the Department of Labor, presented seven propositions which, he said, if adopted generally, would allay fear and start the country right in its attempt to get back to a proper industrial basis. His suggestions included:

1. Begin at once construction of all public works possible, including public buildings—especially schoolhouses.

2. Get behind the "build-a-home" movement by asking for a quota for your community and then publishing each week in your daily papers how you are keeping up with that quota.

3. Get your State this Summer to build its

full quota of federal roads on the 50-50 basis and appropriate a larger sum than ever before for State roads.

4. See that the traction properties of your State and city receive fair treatment, remembering that the transportation system of a city determines more than any other one thing its growth and prosperity.

5. Urge labor to give greater service for its wages, but remember that high wages increase the home market for goods, so that the more money paid in wages the more goods will be purchased and the greater will be the prosperity of your state and city.

6. Get your councils of defense and safety committees to advertise as much now to get people to buy as they advertised during the war to get people to economize.

7. Help Secretaries Wilson, Lane and Redfield and the other cabinet chiefs in their efforts to provide greater opportunities for both capital and labor.

Lieut.-Governor Oglesby of Illinois said that the time is ripe for industry to assume its natural place and also to let the law of supply and demand again come into operation. Governor Catt of Florida said both wages and prices of commodities must come down before industry could resume a normal pre-war basis.

An address was made today by S. M. Williams, President of the Highways Industry Association, in which he discussed the value of road building, not only as a buffer employment for labor but also in its direct relation to the development of the public prosperity and welfare generally. He replied to the speech of Governor Cox, quoting prices for brick and other road materials to show that they were not exorbitant at present, and stated that as 75 per cent of the cost of road construction is labor, there is not much possibility of reducing the cost of road building so long as the present wages maintain.

Discussing business and labor conditions generally, Mr. Williams urged the public to cease looking for a reversion to the prices of 1914, and said that prosperity could only be found when the business men and general public realized that it is necessary to go ahead now with production and expenditure.

Approximate Apportionment of Funds Under Federal Aid Road Act and Amendment Thereto

STATES	Amount Available for Fiscal Years 1917, 1918, 1919	\$50,000,000 for Fiscal Year 1919	Fiscal Year 1920 Allotment	Fiscal Year 1920 \$75,000,000	Fiscal Year 1921 Allotment	Fiscal Year 1921 \$75,000,000	Grand Total
Alabama	\$625,903.17	\$1,050,264.10	\$420,105.64	\$1,575,396.15	\$525,132.05	\$1,575,396.15	\$5,772,197.23
Arizona	411,081.14	685,043.57	274,017.43	1,027,565.36	342,521.79	1,027,565.36	3,767,794.65
Arkansas	498,085.77	840,229.53	336,091.81	1,260,344.30	420,114.76	1,260,344.30	4,615,210.47
California	909,358.99	1,524,248.30	609,699.32	2,286,372.45	762,124.15	2,286,372.45	8,378,175.66
Colorado	508,349.34	867,570.90	347,028.36	1,301,356.35	433,785.45	1,301,356.35	4,759,446.75
Connecticut	185,487.77	307,064.65	122,825.86	460,596.98	153,532.32	460,596.98	1,690,104.56
Delaware	48,965.10	81,384.45	32,553.78	122,076.68	40,692.22	122,076.68	447,748.91
Florida	338,652.69	573,797.20	229,518.88	860,695.80	286,898.60	860,695.80	3,150,258.97
Georgia	806,897.89	1,346,044.75	538,417.90	2,019,067.12	673,022.38	2,019,067.12	7,402,517.16
Idaho	363,862.05	610,509.27	244,203.71	915,763.91	305,254.64	915,763.91	3,355,357.49
Illinois	1,321,102.17	2,185,550.65	874,220.26	3,278,325.97	1,092,775.32	3,278,325.97	12,030,300.34
Indiana	813,473.04	1,349,919.40	539,967.76	2,024,879.10	674,959.70	2,024,879.10	7,428,073.10
Iowa	873,180.41	1,443,046.20	577,218.48	2,164,569.30	721,523.10	2,164,569.30	7,944,106.79
Kansas	588,754.08	1,436,313.93	574,525.57	2,154,470.89	718,156.96	2,154,470.89	7,896,692.32
Kentucky	855,400.35	976,865.17	390,746.07	1,465,297.76	488,432.59	1,465,297.76	5,372,039.70
Louisiana	406,179.27	680,729.03	272,291.61	1,021,093.55	340,364.51	1,021,093.55	3,741,751.52
Maine	290,161.92	481,231.35	192,492.62	721,847.23	240,615.78	721,847.23	2,648,196.53
Maryland	263,013.09	434,737.02	173,894.81	652,105.53	217,368.51	652,105.53	2,393,224.49
Massachusetts	442,814.70	736,883.30	294,753.32	1,105,324.95	368,441.65	1,105,324.95	4,053,542.87
Michigan	872,707.53	1,447,213.80	578,885.52	2,170,820.70	723,606.90	2,170,820.70	7,964,055.15
Minnesota	853,047.58	1,420,774.53	568,309.81	2,131,161.80	710,387.26	2,131,161.80	7,814,642.78
Mississippi	535,469.12	899,488.26	359,795.31	1,349,232.39	449,744.14	1,349,232.39	4,942,961.61
Missouri	1,017,765.21	1,695,314.11	678,125.64	2,542,971.14	847,657.05	2,542,971.14	9,324,904.29
Montana	593,382.46	999,467.15	399,786.86	1,499,200.73	499,733.58	1,499,200.73	5,490,771.51
Nebraska	639,757.68	1,066,642.07	426,656.83	1,599,963.10	533,321.04	1,599,963.10	5,866,303.82
Nevada	386,424.72	642,933.45	257,173.38	964,400.18	321,466.72	964,400.18	3,536,798.63
New Hampshire	125,599.97	207,810.38	83,124.15	311,715.57	103,905.19	311,715.57	1,143,870.83
New Jersey	353,995.26	594,050.80	237,620.32	891,076.20	297,025.40	891,076.20	3,265,844.18
New Mexico	474,847.98	798,785.78	319,514.31	1,198,178.67	399,392.89	1,198,178.67	4,388,898.30
New York	1,501,835.01	2,487,956.40	995,182.56	3,731,934.60	1,243,978.20	3,731,934.60	13,692,821.37
North Carolina	685,702.23	1,139,977.47	455,990.99	1,709,966.20	569,988.74	1,709,966.20	6,271,591.88
North Dakota	458,015.09	768,360.27	307,344.11	1,152,540.42	384,180.14	1,152,540.42	4,222,980.46
Ohio	1,118,759.68	1,854,462.47	741,784.99	2,781,693.71	927,231.24	2,781,693.71	10,205,625.80
Oklahoma	691,906.34	1,153,055.50	461,222.20	1,729,583.25	576,527.75	1,729,583.25	6,341,878.29
Oregon	472,394.85	787,459.10	314,983.64	1,181,188.65	393,729.55	1,181,188.65	4,330,944.44
Pennsylvania	1,382,078.29	2,296,075.85	918,430.34	3,444,113.77	1,148,037.92	3,444,113.77	12,632,849.94
Rhode Island	69,969.51	116,530.95	46,612.38	174,796.43	58,265.48	174,796.43	640,971.18
South Carolina	430,437.00	717,297.05	286,918.82	1,075,945.58	358,648.52	1,075,945.58	3,945,192.55
South Dakota	486,013.67	810,720.68	324,288.27	1,216,081.02	405,360.34	1,216,081.02	4,458,545.00
Tennessee	683,123.95	1,132,103.50	452,841.40	1,698,155.25	566,051.75	1,698,155.25	6,230,431.10
Texas	1,752,770.13	2,926,219.37	1,170,487.75	4,389,329.05	1,463,109.69	4,389,329.05	16,091,245.04
Utah	341,613.62	567,592.10	227,036.84	851,388.15	283,796.05	851,388.15	3,122,814.91
Vermont	136,662.33	225,987.70	90,395.08	338,981.55	112,993.85	338,981.55	1,244,002.06
Virginia	597,102.90	992,052.95	396,821.18	1,488,079.43	496,026.48	1,488,079.43	5,458,162.37
Washington	432,183.03	722,367.25	288,946.90	1,083,550.87	361,183.62	1,083,550.87	3,971,782.54
West Virginia	319,525.27	532,009.10	212,803.64	798,013.65	266,004.55	798,013.65	2,926,369.86
Wisconsin	767,790.41	1,272,946.53	509,178.61	1,909,419.79	636,473.26	1,909,419.79	7,005,228.39
Wyoming	367,396.24	612,912.45	245,164.98	919,368.68	306,456.22	919,368.68	3,370,667.25
Total	\$29,100,000.00	\$48,500,000.00	\$19,400,000.00	\$72,750,000.00	\$24,250,000.00	\$72,750,000.00	\$266,750,000.00
Administration	900,000.00	1,500,000.00	600,000.00	2,250,000.00	750,000.00	2,250,000.00	8,250,000.00
Grand total	\$30,000,000.00	\$50,000,000.00	\$20,000,000.00	\$75,000,000.00	\$25,000,000.00	\$75,000,000.00	\$275,000,000.00

**Problems of Tractor Design Discussed at
Kansas City***(Continued from page 546)*

It was pointed out in the discussion of this paper that the fuel question has an important bearing on the sale of American automotive apparatus in South America. At the present time gasoline sells in Buenos Ayres at 62 to 75 cents per gal. and it is absolutely necessary to lessen the cost of fuel before much demand for automobiles and tractors can be hoped for from that country.

The paper on "The Principles of the Wheel Farm Tractor" by E. R. Hewitt was the same as that presented at the winter meeting of the society. This paper, which had been in the hands of the membership in printed form for some time, brought out considerable contributed discussion. Mr. Hewitt's conclusion that the maximum traction which it is possible to obtain with a cleated wheel is equal to the shearing resistance of the ground over the arc of the circle described by the outer edge of the cleats in passing through the ground was taken exception to by several. It was pointed out that if this was correct a $\frac{1}{2}$ in. cleat would be practically as effective as a 5 in. cleat.

Mr. Greer said that Mr. Hewitt overlooked the advantages of spiral extension cleats, which clear themselves of dirt and which do not cause shearing of the ground. Mr. Greer also disagreed with Mr. Hewitt regarding the relative advantages and disadvantages of the front drive. He said that with front driven tractors over 85 per cent of the weight may be carried on the driving wheels and that the front drive is advantageous on hills. Moreover, plowing represents only about 50 per cent of the work of any tractor, and some of its other uses should be considered in determining the best type.

Vacuum Gage as Power Indicator

Mr. Shoop brought out the point that a wheel with involute cleats would enter and leave the ground perpendicularly. Mr. Horning spoke commendingly of the use of the vacuum gage as a power indicator described by Mr. Hewitt. He said that the conditions of operation of the average tractor engine corresponded to curve 1, Fig. 3, in the paper. As regards the statement that engines were abused in service, there is no load which can possibly be injurious to any first class tractor engine.

Mr. Lohman, who was described as the engineer of a large community farm in Montana, in a written discussion regretted the tendency of tractor manufacturers to over-rate their machines. He said that 50 to 60 per cent of its rated capacity is all the work that a farmer could hope to obtain from the average tractor. The maximum that he had ever been able to get in continued service was 80 per cent of the rated capacity. He also pointed out the important fact that good weather plays a big part on the work of a tractor.

Mr. Lohman took exception to a state-

ment made by Mr. Hewitt regarding the relative merits of wheeled and creeper type tractors. He said that a creeper type tractor when passing over a plowed field will leave as the only sign of its passage a series of splashes of loose earth. Prof. Moyer spoke of the results he had arrived at in experiments on the traction resistance of wheeled tractors, and especially the dependence of that resistance upon the wheel diameter.

Scientific Research in Tractor Design

The last paper of the afternoon was that by Prof. White on "The Redesign of Agricultural Machinery" for tractor work. Prof. White paid a tribute to the men who invented our principal agricultural machines. He said they possessed genius, enterprise and courage, but for the most part they lacked technical education. Most of their work had been done on a cut and dry basis, and as they had been so successful, their successors followed in their footsteps and continued to work by empirical methods. Prof. White asked whether the present generation would have nothing to add to the achievements of these pioneers, and he believed that the great development of the near future would be the application of scientific research work to the elucidation of problems in implement design.

Committees Appointed on Speed of Belts

A meeting of the tractor division of the Standards Committee was held at the Sweeney School on Tuesday morning, most of the members being present. The chief topic of discussion was that of belt speeds. A standard belt speed of 2600 ft. per minute was adopted by the Society last year, but it was found that this is a little too low, especially for the heavier tractors. The subject was discussed at great length and the consensus of opinion seemed to be that two or three different standard belt speeds would be required, ranging perhaps from 2800 to 3500 ft. per minute. Some consideration was also given to belt speeds suitable for small machines usually driven from stationary farm engines, but it is likely that this subject will be assigned to the stationary and farm engine division. A sub-committee is to be appointed to gather data regarding desirable belt speeds and to confer with the American Society of Agricultural Engineers and the National Vehicle and Implement Association on the subject.

Drawbar Height

Another topic discussed was that of drawbar height. This also has been standardized, the standard height being 17 in., but it has been found that this does not fully meet the requirements, and it is likely that a range of drawbar height will be adopted in the future. A sub-committee will be appointed to look after this matter. The subject of a standard drawbar connector, on which Mr. Greer of the Four Wheel Drive Co. has been working, was revived, and a preliminary report was received from a sub-committee on standard wheel rim punching.

Tractor Trials in Great Britain*(Continued from page 547)*

threshing machine than is available in stock. Threshing here has been done mostly by steam power with traction engines which draw the threshing machines and a stacker; and these engines are more powerful than the average tractor, unless the latter is overloaded.

Another seeming market is for either a narrow or a reducible tread tractor chiefly for export to the West Indies for use in sugar and beet plantations. The French have a few promising machines of this sort, chiefly listed for working between vine rows, but they are for the most part too light and not powerful enough for other purposes.

Another point for tractor makers to note is that the exposed tractor wheels with bull-ring drive are not wanted here, because it is found that the teeth become choked. An all enclosed drive is desired, or, at the most, an exposed chain drive. The remark made previously that tractor trials are being developed by the implement makers is amply borne out by the use of the bull gear and cast metal gear exposed drive. Neither from an engineering nor a user's point of view is this sort of drive fitted for a hard worked tractor; but rather only machine cut gear of small dimensions and wholly enclosed in oil-tight cases.

The chain-track form of tractor has no monopoly of favor here. At present one make of this type is being assembled here, presumably to reduce the cost of freight.

The Fordson interests have a factory in course of building at Cork, Ireland, which may be expected to have an important effect on the price and output of that machine.

**Commercial Treaties With South
America**

WASHINGTON, March 3—The United States is negotiating with the countries of Latin America to secure uniform recognition and taxes for traveling salesmen representing American firms in those countries. The new treaty has already been ratified with Uruguay and Guatemala, and provides that the business representatives will be accredited by the United States Department of Commerce and given a special single license that will carry them throughout the country they desire to visit without the payment of special taxes in every section as has heretofore been the custom. Provisions also arrange for a schedule to be drawn whereby samples will be admitted, in some instances free of duty, and in others by bond to re-export them within six months of entry.

Aluminum Production Falls 10 Per Cent

WASHINGTON, March 4—Aluminum production in 1918 was valued at \$41,159,225, a decrease of \$4,722,775, or 10 per cent from the value in 1917. The decrease is due very largely to a decline in the price of that metal during 1918, and does not represent a corresponding decline in quantity of output.

Changes in Nash Sales Force

KENOSHA, March 3—W. W. Smith has been appointed manager of passenger car sales of the Nash Motors Co. to succeed R. P. Bishop, who has resigned. He has been with the factory for the past two years. In 1909 he was connected with the Speedwell Motor Car Co. In 1912 he became sales manager of the American Lock Nut Co. and was later with the Thomas B. Jeffery Co. in an executive capacity, Lts. W. L. Tenney and Haskel Bliss will assist him. Both of these men were released recently from military service.

Rex D. Gilbert, Philadelphia, has been elected secretary and treasurer of the Oldfield Tire Co., Cleveland, the new concern organized by Barney Oldfield, the ex-car racer. Mr. Gilbert was with the Firestone Rubber Co. for the past six years.

A. L. Nelson has been appointed chief engineer of the Premier Motor Corp., Indianapolis, succeeding C. S. Crawford, who has been promoted to director of engineering and assistant general manager. During the war, Mr. Nelson was consulting engineer of Aircraft Armament at McCook Field, Dayton.

John H. Diehl has been elected vice-president of the Mason Tire & Rubber Co., Kent, Ohio.

Maj. William Mitchell Lewis, for many years a car manufacturer of Racine, Wis., has been promoted to lieutenant-colonel in the Signal Corps, U. S. A., of the American Army of Occupation, according to official word received here.

George B. Norcross has been placed in charge of the Detroit branch of the Hess Steel Corp., Baltimore. Previously he represented the company in this district.

Porter Opens New York Office

DAYTON, OHIO, March 3—Finley R. Porter, who completed his work with the Division of Military Aeronautics on March 1, will open headquarters in New York at the Engineers' Club on March 6. R. B. Porter, his son, will be associated with him in his future plans. Mr. Porter's immediate plans call for designs of some heavy engines for transatlantic ships, and after that he will no doubt enter the automobile field again to begin production of the F. R. P. cars in addition to building two or three types of aeronautical engines. Mr. Porter has been with the Bureau of Aircraft Production for the last 10 months as chief motor engineer.

Markley Body Co. Opens in Detroit

DETROIT, March 4—The Markley Commercial Body Co., with its factory and general offices in Pontiac, has opened a branch here at 728 Cass Avenue.

Men
of the IndustryChanges in Personnel and
Position

Kramer New Vice-President of Willys-Overland

TOLEDO, March 1—C. O. Miniger, vice-president in charge of production of the Willys-Overland Co., Toledo, has retired and will devote his entire time to his duties as president and general manager of the Electric Autolite Corp. Leroy Kramer, for many years vice-president in charge of manufacture of the Pullman Co., Chicago, and who for the past six months has been Federal manager of the United States Railroad Administration for the Southwestern district, St. Louis, has succeeded Mr. Miniger.

C. R. Miller, former assistant to the vice-president of the Willys-Overland Co., has been appointed works manager for the factory.

F. A. Petrie, field manager of the Dort Motor Car Co., Flint, will leave in May for a business trip through South America.

Walter H. Schwab, formerly president and general manager of the Auto Parts Mfg. Co., Milwaukee, has become secretary-treasurer of the General Mfg. Corp., which has taken over the business of the Minn Billiard Co., and will manufacture talking machines, pool and billiard tables, motor car specialties, parts and accessories.

W. B. Huntley, until recently a lieutenant in the Ordnance Department, has joined the sales force of the United Alloy Corp., Canton. Prior to his enlistment he was affiliated with the Crucible Steel Co. of America.

Daniel M. Crouse, vice-president and director of the Bossert Corp., Utica, died on Feb. 19.

Morris E. Fuller, founder of the Fuller & Johnson Mfg. Co., Madison, Wis., died at his home in Schuyler, Neb., on Feb. 14, at the age of 98. Mr. Fuller retired from active business about 20 years ago. He was one of the earliest dealers in farm implements in the Middle West.

Judge William J. Turner, Milwaukee, president of the Turner Mfg. Co., Port Washington, Wis., died Feb. 15 at the age of 71 years. His son, Lee H. Turner, is vice-president and general manager of the company. Judge Turner occupied the circuit court bench here for the last ten years.

Unwin to Manage Reo Branch

LANSING, March 4—Maj. Harry Unwin has been appointed manager of the Chicago branch of the Reo Motor Car Co. Major Unwin has just been released from the Ordnance Department and for several months has made his headquarters in this city, where he has had supervision of the tractor contract which the Reo company was completing for the government.

W. E. Perrine, assistant general manager of the Standard Parts Co., will leave Cleveland to enter the executive and production department of the Chevrolet division of the General Motors Co., with headquarters in New York. He will take up his new duties March 1.

L. F. Jalagas, formerly in the wholesale sales department of the Reo branch in Chicago, has become wholesale manager for the South West Motor Co., Kansas City distributor of Reo and Jordan cars.

List Obsolete and Active Planes

WASHINGTON, March 3—A list of airplanes that are considered active, obsolescent and obsolete has been compiled by the Department of Military Aeronautics and a policy has been formulated providing that only repair spare parts can be manufactured for obsolescent planes. A policy for the disposition of the obsolete planes will be announced later. The obsolescent planes will be used until either by accident or wear and tear they are beyond use and it will be left to the judgment of the officers at the fields to decide this.

Following is the list of planes:

Active	
Planes	Engine
Curtiss JN4H (JN4HB).....	Hisp.-Suiza Model 1
Curtiss JN6HO (JN4HG).....	Hisp.-Suiza Mod. E
Curtiss JN7H (JN6HB).....	Liberty 12
De Havilland 4 (JN6HP).....	Le Rhone 80 HP
USD9A (JN6HG1).....	
SE-5 (JN6HG2).....	
VE-7	
S4-C	
Martin Bomber	
Hydros	
Lepere	
Handley-Page	
Spad	
Sopwith Dolphin	
Caproni	
Obsolescent	
Curtiss JN4A	Curtiss OX2
Curtiss JN4B	Curtiss OXX3
Curtiss JN4D	Curtiss OX5
Canadian JN4	Hispano-Suiza Model A
Thomas Morse Scout	Gnome
Obsolete	
Curtiss R4	Thomas Morse 8
Curtiss R2	Curtiss Model O
Curtiss N8	Curtiss OXX
Curtiss Twin	Curtiss OXX-2
LWF	Curtiss N-8
Standard J-1	Sturtevant 5-A
L-2	Hall Scott A5A
R-6	Hall Scott A7A
Martin R	Lawrence
Standard D	Clerget 9
Heinrich C-1	Curtiss V-2
Aero Marine	Curtiss V-X
Boeing	Wright 6-Cyl.
Martin TT	Salmson M-9
Martin R6	Renault 12
Standard H-2	Renault 8
Standard H-3	Sturtevant 4-cyl.
Sturtevant S-4	Aero Daimler 6-cyl.
Bristol Fighters	Curtiss Type 8
Burgess Hydroplane	Laviateur 8

Detroit's 18th Show a Success

DETROIT, March 3—Detroit's eighteenth annual show is in full swing. It opened Saturday night in the Crosstown garage. Forty-five pleasure cars, 33 trucks, three tractors and automobile accessories are represented.

Great crowds visited the show Saturday night and all day Sunday throngs passed up and down the long lanes of cars. As early as Monday afternoon exhibitors were beginning to label numerous cars "sold," and every indication points to the complete demoralization of all previous show sales records.

The passenger car exhibits attract and hold the greatest crowds. Three tractors are on display.

Ford Will Make \$250 Car

(Continued from page 545)

deny the interview said to have been given out to newspaper men in Los Angeles. Mr. Ford is expected in Detroit on Saturday. George S. Anderson, assistant secretary of the Ford Motor Co., said last night that he did not know anything about the correctness of the interview, but admitted that it had been reported to him late yesterday after-

noon and had been taken up with the officials of the company. This is all the Ford officials claim to know about it.

Warnings for Trade With India

MADRAS, INDIA, Feb. 27—A warning has been issued from the consular officer here to American firms wishing to place orders in India, which states that no orders can be placed in America with firms not having agencies in India, since it is a Government rule that these Indian firms must certify to the receipt of articles in good order before payment can be made. Another complaint deals with catalogs sent here without prices.

British Airship Stays in Air 100 Hours

ABERDEEN, SCOTLAND, Feb. 28—Remaining in the air from 2 p. m. on Sunday afternoon to 6.50 p. m. Thursday evening, a British airplane, in charge of Captain Warneford, made a record flight lasting 100 hours and 50 minutes. It ascended from Lenabo naval air station, about 25 miles north of this city. It was forced to descend, according to Captain Warneford, because of shortage of fuel and water. It carried a crew of 11 men and is equipped with beds and cooking apparatus.

Schoof-Gracey Co. to Make Ford Bodies

DETROIT, March 4—The Schoof-Gracey Co. has been organized to take over the commercial body department of the Maurice W. Fox Co., authorized Ford agents. The firm is composed of August F. Schoof and Chester W. Gracey.

Biplanes to Carry Mail to Ships

NEW YORK, March 5—The Kerr Steamship Co. is to operate a fleet of planes to deliver mail from 24 to 36 hours after the ships leave port. Mail will be carried in waterproof sacks and will be dropped on deck by the aviators.

Metz Roadster to Sell for \$1,400

WALTHAM, Feb. 25—The 6-cylinder car which the Metz Co. is putting out will make its appearance about March 15 in three models. The roadster will sell for \$1,400, the touring car for \$1,600 and the closed car for \$2,100.

Dayton Automobile Show Opens

DAYTON, March 4—The Dayton automobile show is in full swing this week. It opened Monday in one of the buildings at the National Cash Register plant. Cars, trucks and tractors are exhibited.

Procedure and Complete Forms for Validating Contracts

(Continued from page 544)

WAR DEPARTMENT
PURCHASE, STORAGE AND TRAFFIC DIVISION
GENERAL STAFF

Washington, March 3, 1919.

SUPPLY CIRCULAR
No. 17

Subject: Procedure on claims for relief under Act of Congress approved March 2, 1919, entitled "An Act to Provide Relief in Cases of Contracts Connected with the Prosecution of the War, and for other Purposes."

The attention of the Supply Bureaus is called to the following resolution of the War Department Claims Board for their information, action and guidance:

Pursuant to the authority conferred upon it by War Department General Order No. 33, in connection with the administration of the powers conferred upon the Secretary of War under and by virtue of an Act entitled "An Act to Provide Relief in Cases of Contracts Connected with the Prosecution of the War, and for other Purposes," (copy of which Act is annexed to this resolution), the War Department Claims Board adopts the following procedure governing the presentation and payment of claims under Sections 1 and 4 thereof.

Attention is called to the fact that the Act does not authorize the execution of contracts which have not heretofore been properly executed. The Bureaus shall not execute contracts with respect to agreements covered by the Act, but shall proceed in the manner hereinafter provided.

1. *Classification of Claims*—For the purposes of administration, claims presented to the Secretary of War under this Act will be classified as follows:

Class A. Claims based on agreements made by an officer or agent acting under the authority, direction or instruction of the Secretary of War, and the nature, terms and conditions of which have been reduced to contract form or are otherwise established by written evidence.

Class B. Claims based on all other agreements covered by the provisions of Section 1 of said Act.

Forms and Procedure with Respect to Class A Claims**2. Form and Method of Presentation.**

(a) Claims falling under Class A shall be presented in the form of "Statement of Claim Form A," hereto attached. They shall be prepared and presented in quadruplicate, each copy being duly executed and verified. The four copies shall be forwarded to the Claims Board in Washington of the Bureau with which the alleged agreement was made. Proper addresses are as follows:

Ordnance Claims Board, War Department, Washington, D. C.
Claims Board, Air Service, War Department, Washington, D. C.
Claims Board, Chemical Warfare Service, War Department, Washington, D. C.

Claims Board, Construction Division, War Department, Washington, D. C.

Claims Board, Director of Purchase, War Department, Washington, D. C.

Claims Board, Signal Corps, War Department, Washington, D. C.

Claims Board, Office Chief of Engineers, War Department, Washington, D. C.

(Claims based on agreements with the Quartermaster Corps should be addressed to the Claims Board, Director of Purchase, as above.)

(b) Attention is called to the fact that under the act these claims must be filed and duly supported by itemized statements before June 30, 1919.

(c) In all cases where settlement negotiations with respect to such agreements are now pending the negotiations will proceed without interruption, but no award can be made until after the statement of claim has been filed in Washington, and the nature, terms and conditions of the agreement certified by the proper Bureau Claims Board and approved by the claimant, all as herein-after provided for.

(d) For further information claimants should apply to the proper Bureau Claims Board in Washington, or to its nearest local representative. All Supply Bureaus of the War Department are directed to facilitate in every way the prompt and proper presentation of these claims.

3. Procedure in the Bureaus after Filing of Claims.

(a) On the presentation of any claim to the Claims Board of a Supply Bureau, all copies of said claim are to be immediately endorsed as follows:

Received by.....
Name of officer or agent.....
Date.....day of....., 1919.

Each claim will receive an identifying number which shall be of a series not at present used in the Bureau, and a record made of its receipt and disposition. In the event that claims are improperly directed to a Bureau and have to be reforwarded from the Board of that Bureau to the Board of another Bureau, they are, nevertheless, to be numbered and stamped with the name of the Officer or Agent receiving them and the date so that the fact of their presentation to the Secretary of War before June 30, 1919, may be clearly established. When forwarded to another Board that Board will give them an identifying number of its series and they will thereafter be recorded and known under that identifying number.

(b) Each Bureau Claims Board upon the proper presentation of any claim is directed to examine into and determine the facts as to the nature, terms and conditions of the alleged agreement referred to in the statement of claim. If it finds that an agreement within the provisions of Section 1 of said Act was entered into, it will make a certificate in the form hereto attached, entitled "Form C." Such certificate shall not be executed except when it is attached to (1) an agreement heretofore reduced to contract form, or (2) a purchase order heretofore signed, or (3) a procurement order or notice of award heretofore signed which sets forth all the terms and conditions of the agreement, or (4) a document to be prepared under the supervision of such Bureau Claims Board fully setting forth the nature, terms and conditions of the agreement, and which may be in the form of such contract or order as should in due course have been formulated to cover the agreement.

(c) The nature, terms and conditions of the agreement thus established and certified shall be submitted to the claimant and no award can be made until the claimant's acceptance and approval of the certificate has been endorsed thereon.

(d) The Bureau Claims Boards are hereby authorized and directed to proceed, on the basis of the agreement thus established, to make detailed examination of the claim and to recommend a fair and equitable basis for the adjustment, payment or discharge thereof. For that purpose, so far as consistent with these or subsequent instructions of the War Department Claims Board, the Bureau Claims Boards may make use of the machinery and procedure which has heretofore been established for the negotiation

of settlement agreements on properly executed contracts which have been suspended or reduced.

(e) The adjustment, payment or discharge shall be recommended in the form of an award or a series of awards using the form attached hereto entitled "Award Form 1," where a single award is made covering the entire agreement, or the form attached hereto entitled "Award Form 2," where the award is one of a series, or the form attached hereto entitled "Award Form 3," where the award is the last of a series of awards. In every case the award shall bear a serial number corresponding to the serial number of the agreement, and where a series of awards are made with respect to a single agreement each award of the series shall be given a consecutive sub-letter, as A, B, C, etc. Each award must be submitted to the claimant and his acceptance endorsed thereon and must be approved by the Bureau Claims Board and by the War Department Claims Board prior to payment.

(f) Wherever, in the judgment of the Board or Officer charged with the duty of recommending a fair and equitable basis upon which the agreement shall be adjusted, paid or discharged, it is to the best interests of the United States to do so, a separate award may be made with respect to any portion of the agreement which has been sublet or with respect to any other clearly separable item of the claim.

(g) When the award is made with respect to any portion of the agreement which has been sublet, payment thereon shall be made in accordance with paragraph 4 of the Act, and disbursing officers are authorized and required to demand that the prime contractor present satisfactory evidence of having paid each sub-contractor with respect to whom the award has been made, or of the consent of each sub-contractor to look for compensation to said prime contractor only; and in the case of the failure of said prime contractor to present such evidence or such consent the disbursing officer shall pay directly to each sub-contractor the amount found to be due him under such award.

Form and Procedure with Respect to Class B Claims

4. Form and Method of Presentation.

(a) Claims falling under Class B shall be presented in the form of "Statement of Claim Form B" hereto attached. They shall be prepared and presented in sextuplicate, each copy being duly executed and verified. The six copies shall be forwarded to the Board of Contract Adjustment, Munitions Building, Washington, D. C.

(b) Attention is called to the fact that under the Act these claims must be filed before June 30, 1919.

5. Procedure by the Board of Contract Adjustment on Class B Claims.

(a) Class B claims shall be submitted to the Board of Contract Adjustment which, in handling them, will follow the procedure above outlined for Class A claims so far as it is applicable; but those claims which are based upon alleged agreements entered into with an officer or agent acting under the authority, direction or instruction of the Secretary of War shall be kept separate and given numbers of a different series from those entered into by an officer or agent acting under the authority, direction or instruction of the President; and the forms of award used by the Board of Contract Adjustment shall provide for signature by that Board and approval by the War Department Claims Board.

(b) The Board of Contract Adjustment will establish, under the direction of the War Department Claims Board, procedure for the proof of claims pending before it.

(c) The Board of Contract Adjustment may, in any case where the nature, terms and conditions of the Agreement have been established and certified by it, refer the claim to the appropriate Bureau Claims Board for action and for recommendation of a fair and equitable basis upon which the agreement should be adjusted, paid or discharged, and the Bureau Claims Board shall then proceed in the manner provided in sub-sections d, e, f and g of Section 3 hereof and in the following General Provisions:

General Provisions

6. Before executing any certificate as to the nature, terms and conditions of an agreement the Bureau Claims Board or the Board of Contract Adjustment shall satisfy itself that the agreement comes within the provisions of Section 1 of the Act. Where, with respect to any claim, a Bureau Claims Board or the Board of Contract Adjustment finds that no agreement within the provisions of Section 1 of the Act has been made, it shall certify to that effect, and transmit a copy of the certificate to the claimant.

7. In the event that the claimant is not willing to accept a finding made or an award recommended by a Bureau Claims Board he may appeal to the Board of Contract Adjustment.

8. Wherever any question arises as to whether a particular Bureau Claims Board or the Board of Contract Adjustment should pass upon a claim under these regulations, that question shall be referred for decision to the War Department Claims Board.

9. There shall be prepared and preserved within the Bureau and in the office of the Board of Contract Adjustment, for transmission to Congress under the direction of the War Department Claims Board, in each case a copy of the certificate of the Board setting forth the nature, terms and conditions of the agreement, together with a copy of the award showing the nature of the payment or adjustment thereof.

10. Attention is called to the fact that in all proceedings under the Act witnesses may be compelled to attend, appear and testify and produce books, papers and letters, or other documents.

11. Bureau Claims Boards and the Board of Contract Adjustment are directed to present to the War Department Claims Board any special cases or classes of cases in which they find that the forms provided for herein cannot adequately or appropriately be employed, and to recommend appropriate forms. BY AUTHORITY OF THE SECRETARY OF WAR: GEORGE W. BURR, Brigadier General, Assistant Chief of Staff, Director of Purchase, Storage & Traffic.

To be presented before June 30, 1919

To be prepared and executed in quadruplicate. Forward all copies to proper Bureau Claims Board, War Department, Washington, D. C.

STATEMENT OF CLAIM FORM A

(To be used in connection with agreements made by an officer or agent acting under the authority, direction or instruction of the Secretary of War, and the nature, terms and conditions of which have been reduced to contract form or otherwise established by written evidence.)

STATEMENT OF CLAIM FOR RELIEF UNDER ACT OF CONGRESS APPROVED MARCH 2, 1919, ENTITLED "AN ACT TO PROVIDE RELIEF IN CASES OF CONTRACTS CONNECTED WITH THE PROSECUTION OF THE WAR, AND FOR OTHER PURPOSES"

To the Secretary of War,

Sir:—

The Claimant, Name.....
Place of business.....
P. O. Address.....
represents,

1. That during the emergency arising from the declaration of war with the German Empire and prior to November 12, 1918, and on or about the.....day of....., 19.., the claimant entered into an agreement with an officer or agent acting under the authority, direction, or instruction of the Secretary of War for

(Here state nature, quantity, unit and aggregate price of the equipment, materials, supplies, services, facilities or other matters covered by the agreement.)

2. That the agreement was entered into in good faith for purposes connected with the prosecution of the war, and the claimant had performed the said agreement in whole or in part, or had made expenditures or incurred obligations upon the faith thereof, prior to November 12, 1918.

(Here state briefly facts showing that there was some performance, expenditure or incurring of obligations on the faith of alleged agreement prior to November 12, 1918.)

3. That the claimant undertakes to furnish prior to June 30, 1919, to the Secretary of War or to such person or persons as he may direct, a properly itemized and duly verified statement or series of statements showing the amount claimed to be due for articles or work delivered and accepted, and also any additional amounts claimed as reimbursement and remuneration for expenditures, obligations and liabilities necessarily incurred, including work, labor and services necessarily rendered, in performing or preparing to perform said agreement.

4. That hereto attached is an attested copy or copies of the best written evidence within the claimant's control of the nature, terms and conditions of the said agreement in the form of

(Here insert a brief description of the written evidence of the agreement as "unsigned contract," "Improperly signed contract," "purchase order," etc. If the agreement was reduced to writing in the form of a contract, purchase order or procurement order, an attested copy of such contract or order should be attached. If the agreement is supported only by letters, telegrams, etc., attested copies of such written documents should be attached and here described. Attested copies of the documents must be attached to each copy of the statement of claim and the claimant must furnish in each case four additional attested copies of the documents referred to in this paragraph.)

5. That the said agreement has not been executed in the manner prescribed by law.

And the claimant requests the Secretary of War to adjust, pay or discharge the said agreement upon a fair and equitable basis as provided in the Act of Congress approved the 2nd day of March, 1919, and entitled "An Act to Provide Relief in Cases of Contracts Connected with the Prosecution of the War, and for other Purposes."

Signature

Claimant.

Executed at on the day of 1919.

Form of Verification Where Claimant is a Corporation

State of of to wit:

(Insert here name of officer or director of the corporation) being first duly sworn, deposes and says that he is the.....

(Insert title) of the claimant named in the

(Insert name of corporation) foregoing statement of claim; that he has read the said statement and knows the contents thereof, and that the said statement is true of his own knowledge, except as to matters which are therein stated on information or belief, and that as to those matters, he believes the statement to be true.

Subscribed and sworn to before me this day of 19..

Notary Public in and for the

..... of State of

Form of Verification Where Claimant is an Individual

State of of to wit:

(Insert here name of claimant) being first duly sworn,

deposes and says that he is the claimant named in the foregoing statement of claim, that he has read the said statement and knows the contents thereof, and that the said statement is true of his own knowledge, except as to matters which are therein stated on information or belief, and that as to those matters he believes the statement to be true.

Subscribed and sworn to before me this day of 19..

Notary Public in and for the

..... of State of

To be presented before June 30, 1919

To be prepared and executed in sextuplicate. Forward all copies to Board of Contract Adjustment, War Department, Washington, D. C.

STATEMENT OF CLAIM FORM B

(To be used in connection with all agreements made by an officer or agent acting under the authority, direction or instruction of the President, and in connection with any agreement made by an officer or agent acting under the authority, direction or instruction of the Secretary of War, the nature, terms and conditions

of which have NOT been reduced to contract form or otherwise established by written evidence.)

STATEMENT OF CLAIM FOR RELIEF UNDER ACT OF CONGRESS APPROVED MARCH 2, 1919, ENTITLED "AN ACT TO PROVIDE RELIEF IN CASES OF CONTRACTS CONNECTED WITH THE PROSECUTION OF THE WAR, AND FOR OTHER PURPOSES"

To the Secretary of War,

Sir:

The Claimant, Name.....
Place of business.....
P. O. Address.....
represents,

1. That during the emergency arising from the declaration of war with the German Empire and prior to November 12, 1918, and on or about the day of 19.., the claimant entered into an agreement with an officer or agent acting under the authority, direction or instruction of the Secretary of War (President of the United States) for

(Here state nature, quantity, unit and aggregate price of the equipment, materials, supplies, services, facilities or other matters covered by the agreement.)

2. That the agreement was entered into in good faith for purposes connected with the prosecution of the war, and the claimant had performed the said agreement in whole or in part, or had made expenditures or incurred obligations upon the faith thereof, prior to November 12, 1918.

(Here state briefly facts as to such performance, expenditures and obligations prior to November 12, 1918.)

3. That the said agreement has not been executed in the manner prescribed by law.

4. The nature, terms and conditions of said agreement are as follows: (The nature, terms and conditions must be specifically stated so that the Board may from the statement decide whether they constitute an agreement within the said Act.)

5. The facts relied upon by the claimant to establish the existence, terms and conditions of such agreement are as follows: (Here insert every fact upon which claimant relies to establish the alleged agreement or embody them in a statement incorporated by reference. The acts of the parties and the circumstances establishing the agreement and its essential elements should be set out free from argumentative or irrelevant matter.)

6. Attached hereto is an itemized and duly verified statement or series of statements,* showing in detail the articles or work delivered and accepted by the United States and the exact nature and extent of all expenditures, obligations or liabilities necessarily incurred, including all work, labor and services necessarily rendered by the claimant in performing or preparing to perform that portion of the agreement additional to the above recited articles or work delivered and accepted. The aggregate amount claimed to be due from the United States to the claimant is

7. The names of all officers or agents who acted under the authority, direction or instruction of the Secretary of War (the President of the United States) in making said agreement so far as known to or ascertainable by the claimant are as follows:

Name and Rank Station

8. The following persons other than the aforesaid officers or agents have personal knowledge of the nature, terms and conditions of said agreement:

Name and Address:

9. Attached hereto, as per schedule below, are copies of all writings in the possession of said claimant bearing on the existence of said agreement or its nature, terms and conditions. (Here list all such writings attached.)

10. Attached hereto is such description as the claimant is able to give of all other writings of which said claimant has information or knowledge bearing on the existence of said agreement or its nature, terms and conditions.

And the claimant requests the Secretary of War to adjust, pay or discharge the said agreement upon a fair and equitable basis as provided in the Act of Congress approved the 2nd day of March, 1919, and entitled "An Act to Provide Relief in Cases of Contracts Connected with the Prosecution of the War, and for Other Purposes."

Signature

Claimant.

Executed at on the day of 1919.

[The same verification forms as for Claim Form A must accompany this claim.—EDITOR.]

FORM C

CERTIFICATE OF EXAMINING BOARD

We, the (Name of Bureau Claims Board or Board of Contract Adjustment) having made due and proper investigation, find that an agreement was entered into in good faith between..... the claimant, and (Give name, rank or title, and corps) an officer or agent acting under the authority, direction or instruction of the Secretary of War (the President of the United States), on or about the day of 19.., during the emergency arising from the declaration of war with the German Empire and prior to November 12, 1918, for a purpose connected with the prosecution of the war; that the agreement had been performed in whole or in part, or expenditures had been made or obligations incurred by the claimant on the faith of such agreement, prior to November 12, 1918; that the agreement has not been executed in the manner prescribed by law, and is within the provisions of Section 1 of the

* Wherever it is possible to state the items of claim on Finance Forms 1 to 10, these forms shall be used. Copies may be obtained from local representatives of bureaus of the War Department or from the Board of Contract Adjustment at Washington. In any case such statements shall include a complete list of all subcontractors, if any, and the amount of the liability claimed to have been incurred as to each by the claimant under such agreement.

Act of Congress approved March 2, 1919, entitled "An Act to provide relief in cases of contracts connected with the prosecution of the war, and for other purposes," and that the documents attached hereto constitute a detailed statement showing the nature, terms, and conditions of said agreement; and we hereby recommend that the Secretary of War proceed to adjust, pay or discharge the said agreement.

(Name of Bureau Claims Board, or Board of Contract Adjustment.)

Dated..... By..... Chairman.

ATTEST:

Secretary or Recorder.

ACCEPTED AND APPROVED:

Dated..... Claimant.

Note: (This certificate shall not be executed except when it is attached to (a) an agreement reduced to contract form, or (b) a signed purchase order, or (c) a signed notice of award or procurement order which sets forth all the terms and conditions of the agreement, or (d) a document prepared under the supervision of the Claims Board or Board of Contract Adjustment and fully setting forth the nature, and conditions of the agreement, all as provided in paragraph 3, sub-paragraph (b), of Supply Circular No. 17.)

AWARD FORM I

CLAIM No.

This Form to be used when a single award is to be made.

AWARD OF SECRETARY OF WAR UNDER THE ACT OF CONGRESS ENTITLED "AN ACT TO PROVIDE RELIEF IN CASES OF CONTRACTS CONNECTED WITH THE PROSECUTION OF THE WAR AND FOR OTHER PURPOSES"

Approved March 2, 1919

It appearing to the satisfaction of the Secretary of War that an agreement was entered into in good faith between the claimant, and (Give name, rank or title, and corps), an officer or agent acting under the authority, direction or instruction of the Secretary of War (the President of the United States) on or about the day of 19.., during the emergency arising from the declaration of war with the German Empire and prior to November 12, 1918, for a purpose connected with the prosecution of the war; that the agreement had been performed in whole or in part, or expenditures had been made or obligations incurred by the claimant on the faith of such agreement, prior to November 12, 1918; that the agreement has not been executed in the manner prescribed by law; that the said agreement is within the provisions of the above entitled Act of Congress; that the documents attached hereto constitute a detailed statement showing the nature, terms and conditions of said agreement; that the claimant presented his claim to the Secretary of War before June 30, 1919; that the sum of \$..... will adjust, pay and discharge such agreement upon a fair and equitable basis and that such sum will not include prospective or possible profits on any part of the agreement beyond the goods and supplies delivered to and accepted by the United States thereunder and a reasonable remuneration for expenditures and obligations or liabilities necessarily incurred in performing or preparing to perform said agreement;

The Secretary of War hereby awards to said claimant the sum of \$..... in full adjustment, payment and discharge of said agreement.

The extent to which this award is made with respect to any portion of the agreement which was sub-let is as follows:

(Here insert a list of all sub-contractors whose claims against the prime contractor are covered by the award, giving the name, place of business, and P. O. address of each, together with the amount awarded with respect to each sub-contract.)

RECOMMENDED BY:

Dated.....

APPROVED:

..... Claims Board

Dated..... Washington, D. C.

APPROVED BY AUTHORITY OF THE

SECRETARY OF WAR:

War Department Claims Board,

By.....

Member

Dated..... Washington, D. C.

ACCEPTED: Claimant.

Dated.....

AWARD FORM 2

This Form to be used when a series of awards are to be made.

CLAIM NO.

AWARD LETTER.....

AWARD OF SECRETARY OF WAR UNDER THE ACT OF CONGRESS ENTITLED "AN ACT TO PROVIDE RELIEF IN CASES OF CONTRACTS CONNECTED WITH THE PROSECUTION OF THE WAR, AND FOR OTHER PURPOSES"

Approved March 2, 1919

It appearing to the satisfaction of the Secretary of War that an agreement was entered into in good faith between the claimant, and (Give name, rank or title, and corps), an officer or agent acting under the authority, direction or instruction of the Secretary of War (the President of the United States) on or about the day of 19.., during the emergency arising

†These documents shall consist of the certificate of the Claims Board or Board of Contract Adjustment (Form C), including the papers thereto attached.

from the declaration of war with the German Empire and prior to November 12, 1918, for a purpose connected with the prosecution of the war, that the agreement had been performed in whole or in part, or expenditures had been made or obligations incurred by the claimant on the faith of such agreement, prior to November 12, 1918; that the agreement has not been executed in the manner prescribed by law; that the said agreement is within the provisions of the above entitled Act of Congress; that the documents attached hereto (to an award heretofore made with respect to said agreement and marked) constitute a detailed statement showing the nature, terms and conditions of said agreement;* that the claimant presented his claim to the Secretary of War before June 30, 1919; that an adjustment, payment or discharge of said agreement upon a fair and equitable basis will include the allowance to the claimant of the sum of \$..... with respect to the following separable item:

(Here insert a description of the item or claim with respect to which the award is made, which may be any clearly separable item of the claim. If the award is made with respect to any portion of the agreement which the claimant shall have sub-let, the statement should include the name, place of business, and P. O. address of the sub-contractor.)

That it is not at this time possible to make a complete award with respect to this agreement and it is of advantage to the United States to make an award at this time with respect to said separable item, and that there is not included in this award, by itself or together with awards heretofore made with respect to said agreement, any prospective or possible profits on any part of said agreement beyond the goods and supplies delivered to and accepted by the United States thereunder, and a reasonable remuneration for expenditures and obligations or liabilities necessarily incurred in performing or preparing to perform said agreement.

The Secretary of War hereby awards to said contractor the sum of \$..... in full adjustment, payment and discharge of said item.

The extent to which this award is made with respect to any portion of the agreement which was sub-let is as follows:

(Here insert a list of all sub-contractors whose claims against the prime contractor are covered by the award, giving the name, place of business, and P. O. address of each, together with the amount awarded with respect to each sub-contract.)

RECOMMENDED BY:

Dated.....
APPROVED BY AUTHORITY OF THE
SECRETARY OF WAR:
War Department Claims Board,
By.....
Member
Dated.....
Washington, D. C.

APPROVED:
By.....
Dated.....
Washington, D. C.

ACCEPTED:

Dated.....
Claimant.

AWARD FORM 3

This Form to be used as
final award of series.

CLAIM NO.....
AWARD LETTER.....FINAL

AWARD OF SECRETARY OF WAR UNDER THE ACT OF
CONGRESS ENTITLED "AN ACT TO PROVIDE RELIEF IN
CASES OF CONTRACTS CONNECTED WITH THE
PROSECUTION OF THE WAR, AND FOR
OTHER PURPOSES"

Approved March 2, 1919

It appearing to the satisfaction of the Secretary of War that an agreement was entered into in good faith between the claimant, and—(Give name, rank or title, and corps) an officer or agent acting under the authority, direction or instruction of the Secretary of War (the President of the United States) on or about the day of 19.., during the emergency arising from the declaration of war with the German Empire and prior to November 12, 1918, for a purpose connected with the prosecution of the war; that the agreement had been performed in whole or in part, or expenditures had been made or obligations incurred by the claimant on the faith of such agreement, prior to November 12, 1918; that the agreement has not been executed in the manner prescribed by law; that the said agreement is within the provisions of the above entitled Act of Congress; that the documents attached to an award heretofore made with respect to such agreements numbered constitute a detailed statement showing the nature, terms and conditions of said agreement; that the claimant presented his claim to the Secretary of War before June 30, 1919; that the sum of \$..... together with the awards heretofore made with respect to the said agreement, will adjust, pay and discharge such agreement upon a fair and equitable basis and that such sum when added to the awards heretofore made will not include prospective or possible profits on any part of the agreement beyond the goods and supplies delivered to and accepted by the United States thereunder and a reasonable remuneration for expenditures and obligations or liabilities necessarily incurred in performing or preparing to perform said agreement.

The Secretary of War hereby awards to said claimant the sum of \$..... in final and full adjustment, payment and discharge of said agreement.

The extent to which this award with respect to any portion of the agreement which was sub-let is as follows:

(Here insert a list of all sub-contractors whose claims against the prime contractor are covered by the award, giving the name,

*These documents shall consist of the certificate of the Claims Board or Board of Contract Adjustment (Form C) including the papers thereto attached.

†These documents shall consist of the certificate of the Claims Board and Board of Contract Adjustment (Form C) including the papers thereto attached.

place of business, and P. O. Address of each, together with the amount awarded with respect to each sub-contract.)

RECOMMENDED BY:

Dated.....
APPROVED:
..... Claims Board
Dated.....
Washington, D. C.

APPROVED BY AUTHORITY OF THE
SECRETARY OF WAR:

War Department Claims Board,
By.....
Member

Dated.....
Washington, D. C.

ACCEPTED:

.....
Claimant.

Dated.....

Following is the complete bill, as agreed to by the Senate-House conferees, and signed:

AN ACT

To provide relief in cases of contracts connected with the prosecution of the war, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

That the Secretary of War be, and he is hereby, authorized to adjust, pay, or discharge any agreement, express or implied, upon a fair and equitable basis that has been entered into, in good faith during the present emergency and prior to November 12, 1918, by any officer or agent acting under his authority, direction, or instruction, or that of the President, with any person, firm, or corporation for the acquisition of lands, or the use thereof, or for damages resulting from notice by the Government of its intention to acquire or use said lands, or for the production, manufacture, sale, acquisition or control of equipment, materials, or supplies, or for services, or for facilities, or other purposes connected with the prosecution of the war, when such agreement has been performed in whole or in part, or expenditures have been made or obligations incurred upon the faith of the same by any such person, firm, or corporation prior to Nov. 12, 1918, and such agreement has not been executed in the manner prescribed by law. *Provided*, That in no case shall any award either by the Secretary of War, or the Court of Claims include prospective or possible profits on any part of the contract beyond the goods and supplies delivered to and accepted by the United States and a reasonable remuneration for expenditures and obligations or liabilities necessarily incurred in performing or preparing to perform said contract or order: *Provided further*, That this act shall not authorize payment to be made of any claim not presented before June 30, 1919: *And provided further*, That the Secretary of War shall report to Congress at the beginning of its next session following June 30, 1919, a detailed statement showing the nature, terms, and conditions of every such agreement and the payment or adjustment thereof: *And provided further*, That no settlement of any claim arising under any such agreement shall bar the United States Government through any of its duly authorized agencies, or any committee of Congress hereafter duly appointed, from the right of review of such settlement, nor the right of recovery of any money paid by the Government to any party under any settlement entered into, or payment made under the provisions of this act, if the Government has been defrauded, and the right of recovery in all such cases shall exist against the executors, administrators, heirs, successors, and assigns, of any party or parties: *And provided further*, That nothing in this act shall be construed to relieve any officer or agent of the United States from criminal prosecution under the provisions of any statute of the United States for any fraud or criminal conduct: *And provided further*, That this act shall in no way relieve or excuse any officer or his agent from such criminal prosecution because of any irregularity or illegality in the manner of the execution of such agreement: *And provided further*, That in all proceedings hereunder witnesses may be compelled to attend, appear, and testify, and produce books, papers and letters, or other documents; and the claim that any such testimony or evidence may tend to criminate the person giving the same shall not excuse such witness from testifying, but such evidence or testimony shall not be used against such person in the trial of any criminal proceeding.

Sec. 2. That the Court of Claims is hereby given jurisdiction on petition of any individual, firm, company or corporation referred to in Section 1 hereof, to find and award fair and just compensation in the cases specified in said section in the event that such individual, firm, company or corporation shall not be willing to accept the adjustment, payment, or compensation offered by the Secretary of War as hereinbefore provided, or in the event that the Secretary of War shall fail or refuse to offer a satisfactory adjustment, payment or compensation as provided for in said section.

Sec. 3. That the Secretary of War, through such agency as he may designate or establish is empowered, upon such terms as he or it may determine to be in the interest of the United States, to make equitable and fair adjustments and agreements, upon the termination or in settlement or readjustment of agreements or arrangements entered into with any foreign government or governments or nationals thereof, prior to Nov. 12, 1918, for the furnishing to the American Expeditionary Forces or otherwise for war purposes of supplies, materials, facilities, services or the use of property, or for the furnishing of any thereof by the United States to any foreign government or governments, whether or not such agreements or arrangements have been entered into in accordance with applicable statutory provisions; and the other provisions of this act shall not be applicable to such adjustments.

Sec. 4. That whenever, under the provisions of this act, the Secretary of War shall make an award to any prime contractor with respect to any portion of his contract which he shall have sublet to any other person, firm or corporation who has in good faith made expenditures, incurred obligations, rendered service, or furnished material, equipment, or supplies to such prime contractor, with the knowledge and approval of any agent of the Secretary of War duly authorized thereunto, before payments of said award the Secretary of War shall require such prime contractor to present satisfactory evidence of having paid said subcontractor or of the consent of said subcontractor to look for his compensation to said prime contractor only; and in the case of the failure of said prime contractor to present such evidence or such consent the Secretary of War shall pay directly to said subcontractor the amount found to be due under

Calendar

ENGINEERING

- March 7—New York. S. A. E. Aircraft Meeting at Engineering Societies Bldg.
April 2—Minneapolis Section, S. A. E. — Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

SHOWS

- March 1-8—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Stuart, Manager.
March 1-8—York, Pa. York Automobile Dealers' Assn.
March 1-15—New York Aeronautical Exhibition, Manufacturers' Aircraft Assn., Madison Square Garden and 69th Regiment Armory.
March — Scranton, Pa. Thirtieth Regiment Armory, Scranton Automobile Assn.
March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrandt, Manager.
March—Philadelphia, Pa. Philadelphia Automobile Trade Assn. Passenger cars.
March 3-8 — Muskegon, Mich. Third Annual, Armory, Muskegon Lodge No. 274, B. P. O. E. John C. Fowler and George M. Friant, Managers.
March 3-8—Dayton, O., N. A. C. A. Building.
March 3-8—Columbus, O. Columbus Automobile Show Co., Memorial Building, W. W. Freeman, Manager.
March 3-8—Raleigh, N. C. Third Annual, H. B. Bolton, Manager.
March 3-8—Scranton, Pa. Ninth Annual, 13th Regiment Armory, Scranton Automobile Assn. Hugh B. Andrews, Manager.
March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.
March 3-8—Richmond, Va. Third Annual, Richmond Automobile Trade Assn., Gray's Armory.
March 5-8—Lancaster, Pa. Automobile Trade Assn., Rowe Motor Co.'s Bldg., R. W. Shreiner, Manager.
March 8-15 — New Brunswick, N. J. Armory, New Brunswick Motor Trade Assn. William Kuehle, Manager.
March 8-15 — Philadelphia, Pa. Philadelphia Automobile Trade Assn., Commercial Museum, A. L. Maltby, Manager.
March 10-12 — Lancaster, Pa. Truck Show.
March 10-15—Paterson, N. J. Paterson Automobile Trade Assn., Fifth Regiment Armory, H. MacGinley, Show Manager.
March 10-15 — Salt Lake City, Utah. Sixth Annual, Bonneville Pavillon, W. D. Rishel, Manager.
March 10-15 — St. Louis, Mo. Used Car Show, Exhibit Building, Robert E. Lee, Manager.
March 10-15—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.
March 10-15 — Omaha, Neb. Fourteenth Annual, Omaha Automobile Trade Assn., Auditorium, Clark G. Powell, Manager.
May 10-17—Bristol, Va.—Tenn. Cars, Trucks, Tractors, Airplanes and accessories, Bristol Chamber of Commerce, C. W. Roberts, Manager.
March 12-18—Peoria, Ill. Passenger cars, 12 to 15; trucks, 17 and 18.
March 15-22 — Boston, Mass. Boston Automobile Dealers' Assn. Passenger cars only, Chester I. Campbell, Manager.
March 15-22 — Harrisburg, Pa. Harrisburg Motor Dealers' Assn., Overland Warehouse, J. Clyde Myton, Manager.
March 17-22 — Great Falls, Mont. Montana Automobile Distributors' Assn.
March 17-22—Philadelphia, Pa. Motor Truck Assn., Commercial Museum.
March 18-22 — Zanesville, O. Third Annual, Zanesville Motor Car Dealers' Assn., City Hall and Market House, Edward B. Roemer, Manager.

- March 19-22 — St. Joseph, Mo. St. Joseph Automobile Show Assn., Auditorium, John Aibus, Manager.
March 19-22—Norfolk, Neb. Norfolk Automobile Show Assn.
March 19-22—Warren, Pa. Third Annual, Warren Automobile Dealers' Assn.
March 22-29—Pittsburgh Automobile Dealers' Assn. of Pittsburgh, John J. Bell, Manager.
March 24-29—New Orleans, La. Henry B. Marks, Manager.
March 24-29—Greenfield, Mass. Greenfield Automobile Dealers' Assn., State Armory, James J. Callahan (Pittsfield) Manager.
March 24-29—Utica, N. Y. Utica Motor Dealers' Assn.
March 25-29—Wilmington, Del. Fourth Annual, Wilmington Rink.
March 26-29—Watertown, N. Y. Tenth Annual, State Armory, Automobile Dealers, Inc. Arthur E. Sherwood, Manager.
March 27-29—Holdrege, Neb. Third Annual, Holdrege Automobile Dealers' Assn.
March 28-30—Peru, Ill. Illinois Valley Auto Show.
Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.
Last of March—Harlan, Ia. Southwestern Iowa Motor Exhibit.
March 29-April 5 — Passenger Cars, April 8-12—Trucks Brooklyn, Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkman, Manager.
March 31-April 5—Cumberland, Md., Automobile Dealers Assn., Armory.
April 1-5—Denver, Col.—Denver Automobile Trades Assn. Stadium.
April 5-12 — Bridgeton, N. J. Fourth Annual, Automobile Dealers' Assn.
April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink, T. C. Kirby, Manager.
April 8-12—Deadwood, S. D. Seventh Annual, Cars and Tractors, Deadwood Business Club.

- April 16-19 — Waynesburg, Pa. Automobile Dealers' Assn. of Greene Co., Armory, Frank L. Hoover, Mgr.
Not decided—Bridgeport, Conn. Auspices of City Battalion, B. B. Steiber, Manager.
Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.
June 2-6—Hot Springs, Va. Convention, Automotive Equipment Assn., Homestead Hotel.

TRACTOR SHOWS

- Mar. 10-15—Macon, Ga. Dixie National Power Farming Demonstration, A. E. Hildebrand, General Manager.
July—Wichita, Kan., Automotive Committee of National Implement Assn.

RACES

- March 15—Santa Monica, Cal. Speedway.
March 23—Los Angeles. Ascot Speedway Assn., Ascot Speedway, 150 miles.
May 17—Uniontown, Pa., probably 112½ miles.
May 31—Indianapolis, Indianapolis Motor Speedway Assn., 500 miles.
July 5—Cincinnati, O., Speedway.
July 19—Uniontown, Pa. Speedway race.
July 26—Sheepshead Bay, L. I. Speedway race.
Aug. 22-23—Elgin, Ill. Speedway.
Aug. 23—Sheepshead Bay, L. I. Speedway race.
Sept. 1—Uniontown, Pa. Speedway race.
Sept. 20—Sheepshead Bay, L. I. Speedway race.
Oct. 1—Cincinnati, O. Speedway race.

CONVENTIONS

- March 7—Automobile Export Managers Convention, N. A. C. C. headquarters, New York.
April 10-12—Philadelphia. National Assn. of Motor Truck Sales Mgrs., Bellevue-Stratford.
April 24-26—Chicago — National Foreign Trade Council, Sixth National Foreign Trade Convention, Congress Hotel.

said award; and in case of the insolvency of any prime contractor the subcontractor of said prime contractor shall have a lien upon the funds arising from said award prior and superior to the lien of any general creditor of said prime contractor.

Sec. 5. That the Secretary of the Interior be, and he hereby is, authorized to adjust, liquidate, and pay such net losses as have been suffered by any person, firm, or corporation, by reason of producing or preparing to produce, either manganese, chrome, pyrites, or tungsten in compliance with the request or demand of the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation to supply the urgent needs of the Nation in the prosecution of the war; said minerals being enumerated in the act of Congress approved Oct. 5, 1918, entitled "An act to provide further for the national security and defense by encouraging the production, conserving the supply, and controlling the distribution of these ores, metals, and minerals which have formerly been largely imported, or of which there is or may be an inadequate supply."

The said Secretary shall make such adjustments and payments in each case as he shall determine to be just and equitable; that the decision of said Secretary shall be conclusive and final, subject to the limitation hereinafter provided; that all payments and expenses incurred by said Secretary, including personal services, traveling and subsistence expenses, supplies, postage, printing, and all other expenses incident to the proper prosecution of this work, both in the District of Columbia and elsewhere, as the Secretary of the Interior may deem essential and proper, shall be paid from the funds appropriated by the said act of Oct. 5, 1918, and that said funds and appropriations shall continue to be available for said purpose until such time as the said Secretary shall have fully exercised the authority herein granted and performed and completed the duties hereby provided and imposed: *Provided, however*, That the payments and disbursements made under the provisions of this section for and in connection with the payments and settlements of the claims herein described, and the said expenses of administration shall in no event exceed the sum of \$8,500,000: *And provided further*, That said Secretary shall consider, approve, and dispose of only such claims as shall be made hereunder and filed with the Department

of the Interior within three months from and after the approval of this act: *And provided further*, That no claim shall be allowed or paid by said Secretary unless it shall appear to the satisfaction of the said Secretary that the expenditures so made or obligations so incurred by the claimant were made in good faith for or upon property which contained either manganese, chrome, pyrites, or tungsten in sufficient quantities to be of commercial importance: *And provided, further*, That no claims shall be paid unless it shall appear to the satisfaction of said Secretary that moneys were invested or obligations were incurred subsequent to April 6, 1917, and prior to Nov. 12, 1918, in a legitimate attempt to produce either manganese, chrome, pyrites, or tungsten for the needs of the Nation for the prosecution of the war, and that no profits of any kind shall be included in the allowance of any of said claims, and that no investment for merely speculative purposes shall be recognized in any manner by said Secretary: *And provided further*, That the settlement of any claim arising under the provisions of this section shall not bar the United States Government, through any of its duly authorized agencies, or any committee of Congress hereafter duly appointed, from the right of review of such settlement, nor the right to recover any money paid by the Government to any party under and by virtue of the provisions of this section, if the Government has been defrauded, and the right of recovery in all such cases shall extend to the executors, administrators, heirs, and assigns of any party.

That a report of all operations under this section, including receipts and disbursements, shall be made to Congress on or before the first Monday in December of each year.

That nothing in this section shall be construed to confer jurisdiction upon any court to entertain a suit against the United States: *Provided further*, That in determining the net losses of any claimant the Secretary of the Interior shall, among other things, take into consideration and charge to the claimant the then market value of any ores or minerals on hand belonging to the claimant, and also the salvage or usable value of any machinery or other appliances which may be claimed was purchased to equip said mine for the purpose of complying with the request or demand of the agencies of the Government above mentioned in the manner aforesaid.